

THE SCOTTISH GEOGRAPHICAL MAGAZINE



Volume 70, No. 2

September 1954

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Royal Scottish Geographical Society

THE ANNUAL GENERAL MEETING

WILL BE HELD IN THE SOCIETY'S ROOMS, SYNOD HALL, CASTLE TERRACE,
EDINBURGH, on Tuesday, 5th October 1954, at 3.30 P.M.

BUSINESS

1. Report of Council for Session 1953-54.
2. Financial Report 1953-54.
3. Amendments proposed to the Constitution :
 - (a) Delete Clause 4.
 - (b) Add new Clause 7A : " Any person approved by the Council may be admitted a Junior Associate with such privileges as the Council may determine, but shall not be eligible to hold office nor to vote at meetings of the Society."
 - (c) Add to Clause 8 : " Members subscriptions shall be due and payable on 1st October."
 - (d) Add to Clause 12, after " Editor " the words " Lecture Organiser," and add at the end : " in addition to the eight Vice-Presidents provided for in Clause 16."
 - (e) Alter " Chairman " to " Vice-Chairman " in Clauses 13, 23, 24A and 26.
 - (f) Add at the end of Clause 14 : " who shall at the same time give notice of the business to be transacted. Fourteen days' notice of such meetings must be given to members of Council, and no other business may be transacted except the business specified in the notice calling the meeting."
 - (g) In Clause 15, line two, alter " recommendation " to " nomination."
 - (h) In Clause 16, line four, alter " six " to " eight," and alter " they " in line five to " The latter."
 - (i) In Clause 17, line one, insert " other " before " honorary."
 - (j) In clause 20, line three, alter " recommend " to " nominate," and on line four alter " Nominations of other Members for election to the Council " to " Other nominations."
 - (k) In Clause 24 after " Vice-Presidents " insert " or the Chairman of a Branch."
 - (l) Add new Clause 25A : " The Council may arrange for lectures to be given. Admission to the lectures shall be on such conditions as the Council may determine."
 - (m) In Clause 26 after " Standing Committees " insert " and the immediate Past President." Delete " and " after " Honorary Secretaries."
 - (n) In Clause 27, after " Society " insert " viz ; Finance, Lecture, Library, Magazine, and Awards Committees."

[OVER

(o) Add new Clause 27A : "The Council may also appoint such other Committees as may be required, for such time and with such powers as the Council may determine. The Convener of each such Committee must be a member of Council, and shall report to the Council at least once a year on the work of the Committee. The President and the Honorary Secretaries shall be *ex officio* members of all such Committees."

(p) In Clause 32, line three, alter "Society" to "Council."

(q) Add at end of Clause 33 : "or with the approval of the Council in the name of a Bank Nominee Company."

(r) In Clause 41 after "Honorary" insert "Life."

(s) Add new clause at end : "The Council may confer Medals and Awards on the recommendation of the Awards Committee."

(t) Renumber the Clauses throughout 1 to 49.

4. Election of Council and Office-Bearers for 1954-55.

The Council recommend that the following be elected as :—

President : Douglas A. Allan, C.B.E., D.Sc., Ph.D., F.R.S.E., F.R.S.G.S.

Vice-President : John Bartholomew, M.C., J.P.

Vice-Presidents serving on Council :—

Sir Hugh McPherson.

Alexander Harrison.

J. Cameron Smail.

Archibald E. Robertson.

Douglas Guthrie.

John Johnston.

Arthur W. Russell.

John Bartholomew.

Members of Council :

William Burns.

Miss B. P. MacFarlane.

Lady A. M. Clow.

H. A. Moisley.

G. C. Dewar.

Henry M. Paton.

George Dott.

J. E. Richey.

Arthur Geddes.

F. D. N. Spaven.

A. B. Hyslop.

Betty M. Third.

J. B. Hamilton.

William Watt.

William Latimer.

Chairman of Branches :

Glasgow : Ronald Miller.

Dundee : John Watson.

Aberdeen : Andrew C. O'Dell.

Joint Honorary Secretary : John C. Bartholomew.

Auditor :

Gordon G. Ruffle, C.A.

Other Office-Bearers : All those who are eligible for re-election, to be reappointed to their offices.

BRIAN K. D. ROBERTSON,
Secretary.

SYNOD HALL, EDINBURGH, 1,
1st September 1954.

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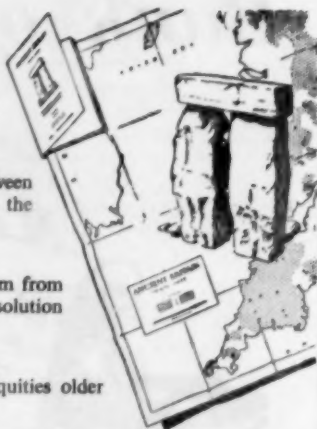
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POPULATION AND SETTLEMENT IN NOVA SCOTIA

By PEGGIE M. HOBSON

HISTORY OF SETTLEMENT

THE composition and distribution of the population of Nova Scotia to-day is unintelligible without some knowledge of its long and complicated history.¹ Although New Scotland was granted its charter by James VI in 1621, and although much of the province is essentially Scottish in character to-day, nevertheless the earliest settlements were made by the French. Large-scale Scottish immigration² did not begin until the time of the Highland Clearances in the latter part of the eighteenth century. The French colony which was established at Port Royal in 1605 is of great importance in North American history, since it was the first permanent white settlement to be made north of the Gulf of Mexico.

The French settlements were most numerous in the Port Royal area of the Annapolis Valley, around the shores of the Minas Basin, and on the Isthmus of Chignecto. These areas together became the heart of Acadia and remained so until 1755, when the French were distributed amongst the English colonies³ to the southward at the beginning of the Seven Years' War. At the end of the war, thousands of acres of good farm land which had been laboriously drained and improved by the French in earlier years⁴ were willingly settled by New Englanders, whose descendants form the majority of the inhabitants of the region at the present time. In fact, the influx of the industrious New Englanders into western Nova Scotia between 1760 and 1765 was the most important of all the migrations into the province throughout its history. All their settlements have persisted to the present day, as have the New England influences upon the economy of the region and upon the culture and traditions of the people.⁵

Although the French were driven out so ruthlessly two hundred years ago, there are over 60,000 French people in Nova Scotia to-day. Almost all are direct descendants of small groups of returned exiles who managed to settle down in scattered coastal localities before the

end of the eighteenth century. These people have retained their language, their religion, their small family farms and their traditional way of life. Their settlements are now located in the extreme south west in Digby and Yarmouth Counties, in the northern part of Antigonish County, and in Cape Breton Island particularly in Richmond County and also in the Cheticamp region of Inverness.

In addition to the New Englanders, a considerable number of 'Scotch-Irish' also settled in Nova Scotia in the mid-eighteenth century. Some came direct from Northern Ireland, but many came via New England and settled in the Cobequid district, in the townships of Truro and Londonderry. Between 1772 and 1775 over a thousand Yorkshiremen, mostly industrious and prosperous farmers, landed in Nova Scotia and settled around Sackville, then in Cumberland County. The descendants of both these groups can still be identified, and their settlements are situated on some of the best farming land in the whole of the province.

In the meantime, Halifax, the capital, had been founded by the English in 1749, and after this, British settlements were gradually established throughout the province, particularly in the west. In 1753 Lunenburg became the centre of a Lutheran German-speaking community which is still distinctive in Nova Scotia, although it no longer retains the mother tongue. Both Lunenburg and Queen's Counties still have a considerable proportion of people of German descent. There were French Huguenots and Swiss among the original settlers; not all were Lutherans.

Thus, before 1775 many different types of settlements existed in the western part of the province, but to the east of a line from Halifax to Truro the only settlements, apart from small fishing stations, were at Tatamagouche, opposite Prince Edward Island, and at Pictou. By 1783 several thousands of Loyalists had moved northwards into Quebec and Nova Scotia, and 20,000 of them, including some negroes, became permanent settlers in peninsular Nova Scotia, and a further 500 settled in Cape Breton Island. Cape Breton, however, had not remained so sparsely populated purely on geographical grounds, for it was not until 1784, when the island was given a separate government—which only lasted until 1820—that settlers were encouraged to apply for land. Sydney was founded in 1785. Hence, when the last and largest immigration into Nova Scotia took place, the only unoccupied land, apart from the forested interior, was the upland country of the east. It was here that thousands of Highland Scots settled between 1773 and 1838.

The migration of Highland Scots to Nova Scotia⁶ began with the arrival of the *Hector* at Pictou in 1773. There was a lull during the Revolutionary War, but immigration increased immediately afterwards and reached its maximum between 1790 and 1830.⁷ The Highland immigrants were very different from the earlier settlers. For most of them immigration had become a necessity,⁸ due to overcrowding and oppression resulting from the changed economy of the Highlands during the latter part of the eighteenth century. Although many organisations, as well as landlords, raised funds for passage money,

many of the emigrants were cruelly exploited by unscrupulous agents, and their journeys were often accompanied by danger, great discomfort and by disease. These people were ill equipped to establish new settlements. They came from a primitive society, they had no experience of commercial, administrative or political matters; many of them were illiterate and few knew any language other than Gaelic. Moreover, they found themselves in a strange land where they had no money and few opportunities for making a living. They were unaccustomed to the severity of the winters and to the dense forests which covered the entire country. The great hardships which they endured have been described elsewhere.⁶ It is indeed creditable that many permanent settlements were established, some of them in very inhospitable places.

The Highland Scottish settlements of Nova Scotia are now concentrated into the four eastern counties of Pictou and Antigonish, on the mainland, and Victoria and Inverness in Cape Breton Island. Cape Breton Island, in fact, contains the largest Gaelic-speaking population in the World outside the mother country, and even now it has 70 per cent. of all the Gaelic speakers of Canada. The Highland immigrants, who were either Roman Catholics or Presbyterians, settled in different districts, according to their religion and in the groups in which they had travelled. The two mainland counties were settled first: Pictou by the Protestants, and Antigonish by Roman Catholics. By 1835, however, there were also Gaelic-speaking settlements in many parts of Cape Breton Island and, as on the mainland, Catholics and Protestants usually established separate communities. It is estimated that 25,000 Highlanders settled in Cape Breton Island within less than forty years. At first the authorities attempted to apportion grants of land on an equitable basis, but as time went on, later settlers had to occupy either inhospitable upland sites or else they squatted on Crown lands to which they had no legal right. The latter was a common practice particularly in Cape Breton, where to this day there are considerable tracts of land for which no proper assignments have been made. The result was that by the time that immigration ceased, soon after 1838, the better lands were often as congested as those which the people had vacated in Scotland, and in the upland areas many sites were cleared which should have remained permanently under forest. These upland settlements were often designated 'mountain', e.g. Lewis Mountain and Skye Mountain, etc., and it is not surprising that such settlements were among the first to be abandoned when emigration began.

COMPOSITION AND DISTRIBUTION OF POPULATION

The total population of Nova Scotia in 1941 was 577,962—642,584 in 1951—which represented 5 per cent.—in 1951, 4.6 per cent.—of the Canadian total.⁹ Although the population has increased continuously since 1871, except between 1921 and 1931, nevertheless the rate of increase has been much slower than in the newer parts of Canada and the percentage of the Canadian total has shown a progressive decline. The increase in population which has occurred has been due entirely

to the natural increase, as there has been comparatively little immigration into the province for almost a century. Thus the majority of the inhabitants are direct descendants of the original settlers, and in 1941 no less than 93 per cent. of the population were Canadian born.

Since 1871 there has been a considerable amount of emigration from the province and much rural depopulation. Both movements have been largely from the remoter districts, especially in Cape Breton Island where rural depopulation has caused problems very comparable to those of similar areas in the Highlands of Scotland.¹⁰ The increase in population which has occurred since 1931 has been due partly to increased industrialisation, but more particularly to a difficulty in emigrating resulting in greater natural increase. In the nineteenth century, the majority of Nova Scotians emigrated to the New England States, although some went to the Mid West and even to California. In the twentieth century, they have gone to western Canada as well as to Ontario and Quebec.

The average density of population for the whole province is considerable—28 per square mile—especially in relation to its natural resources, but the distribution of the population is very uneven. This can be attributed to the physical features of the province, to the continuous forest cover of the interior, to the uneven distribution of the mineral wealth, and also partly to the distribution of the different ethnic groups. Cape Breton County has an average density of 114 per square mile and an urban density of 84 per square mile. Victoria County, by contrast, has no urban population and its average density—i.e. its rural density also—of population is only 7 per square mile.

Only three counties in Nova Scotia have over 60 per cent. of their population classed as urban. They are: Cape Breton County 74 per cent., Halifax 66 per cent., and Pictou 60 per cent. Cape Breton County, with its important coal mines and heavy iron and steel industries at Sydney, has by far the largest industrial concentration in the Maritime Provinces, and it also has the highest proportion of foreign workers. Pictou is another industrial county, but its mining and industrial activities, centred on New Glasgow, are on a much smaller scale than those of Cape Breton. Halifax's high urban percentage is due to the size of the capital city and its adjacent urban areas. The city of Halifax now has a population (1951 census) of 85,589, the metropolitan area, of 133,931, and the county, of 162,217.

The remaining fifteen counties are mainly rural in character and two of them, Victoria and Richmond, both in Cape Breton Island, are exclusively so. Although some rural areas have shown considerable increases in population since 1931, these have often been due to a lack of opportunity to emigrate and are, therefore, not the result of prosperity but, rather, the cause of unemployment.¹¹ Since the end of the second world war, concerted efforts have been made to provide more employment within the province, and both the Nova Scotia Research Foundation and all departments of the Nova Scotian government are actively engaged in promoting the fullest use of its resources. At the same time, the rapid developments proceeding in other parts of Canada also offer opportunities for employment, without the necessity to

emigrate. Another factor which should prove of mutual economic benefit to both Nova Scotia and Newfoundland, was the incorporation of the latter into Canada in 1949.

The ethnic composition of the population of Nova Scotia reflects the history of its settlement very clearly indeed. In 1941 the ethnic origin of the population was as follows * :—

ETHNIC GROUP	POPULATION	PERCENTAGE OF TOTAL POPULATION
English	221,442	38
Scottish	154,846	27
Irish	65,300	11
Others	3,590	1
<i>Total British</i>	<i>445,178</i>	<i>77</i>
French	66,260	12
Netherlands	23,834	4
German	15,038	3
Others	27,652	4
<i>Total</i>	<i>577,962</i>	<i>100</i>

Although the increase in population since 1871 has been due to natural increase, the rates of increase for the different ethnic groups have varied considerably. For example, the French stock has increased greatly while the proportion of Scots and of Irish has fallen.

CHANGES IN THE COMPOSITION OF THE POPULATION OF THE
MARITIME PROVINCES SINCE 1881 (PERCENTAGES)

	<i>French</i>		<i>Scottish</i>		<i>Irish</i>	
	1881	1941	1881	1941	1881	1941
Nova Scotia	9	12	33	27	15	11
Prince Edward I.	10	16	45	34	23	19
New Brunswick	18	36	16	14	32	15

"The small immigration into the Maritimes has permitted the full effects of the higher fertility of the French to be reflected in the population statistics, and the numerical strength of the French has been further augmented by the repatriation of many peoples of French origin from the U.S.A." ¹²

The distribution of the various ethnic groups, by counties, reminds us of the complexity of the history of the settlement of this province. In every county at least 35 per cent. of the population is of British descent, and in 7 of the 18 counties the percentage is over 85. These counties include the areas settled largely from New England, from Yorkshire, and from Scotland. At the other end of the scale are Digby and Richmond Counties with only 45 and 38 per cent. of British people, respectively, and Lunenburg with 47. The former are areas with large

ETHNIC ORIGIN OF POPULATION OF NOVA SCOTIA

1941

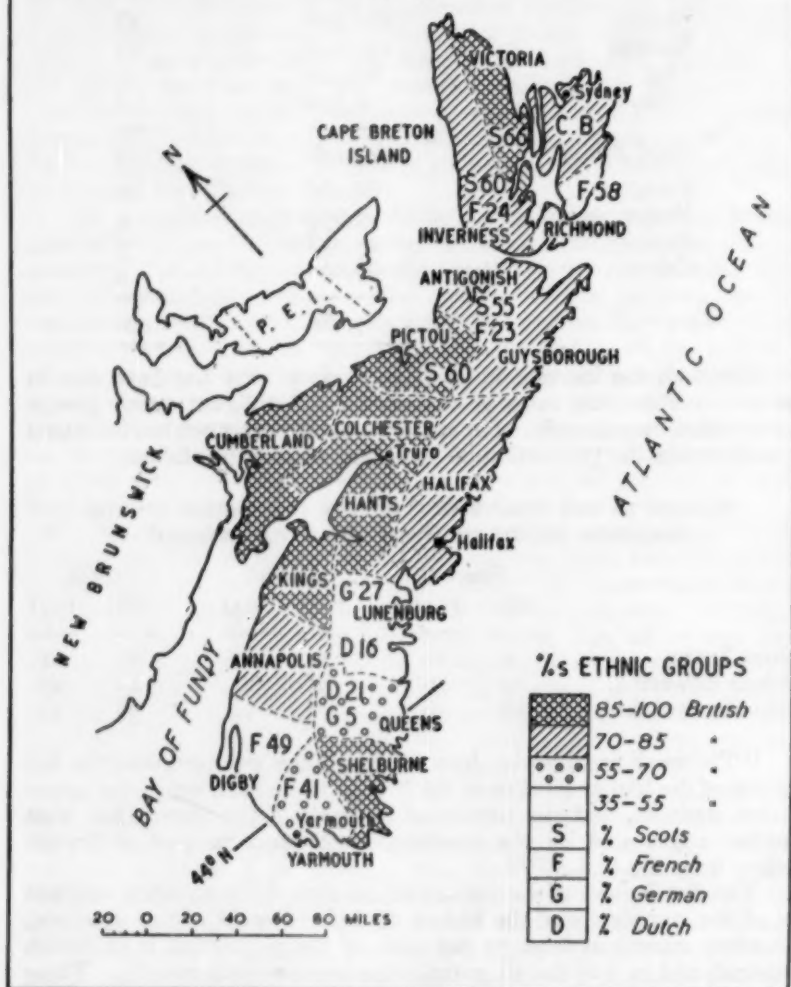


Fig. 1. Ethnic origin of the population of Nova Scotia in 1941.

French settlements, and the latter was the seat of the Lutheran community of the mid-eighteenth century. Among the essentially British counties, Shelburne has the highest percentage of English people, 73, and Victoria the highest percentage of Scots, 66. Shelburne was settled by Loyalists in 1783, and Victoria received many Highland Scottish immigrants in the early nineteenth century. It was at St Ann's, Victoria County, that the Rev. Norman Macleod, originally from the Assynt district of Sutherland, and his followers, landed in 1820 and founded a staunchly Presbyterian settlement. Although Macleod and over 100 of his people left for New Zealand in 1851, and 700 more followed in the next eight years, many Scots remained in the St Ann's district, which is still strongly Presbyterian and is now the headquarters of the Gaelic College and of the annual Mod. The other Scottish counties are Inverness, 60 per cent. Scottish, Pictou 60 per cent., and Antigonish 55 per cent. The two mainland counties were settled directly from Scotland, but the first Highlanders to settle in Cape Breton came via Pictou or Prince Edward Island; later arrivals were landed on Cape Breton itself. The Irish figures are less easy to interpret since they include some of the 'Scotch-Irish' and also many Newfoundland fishermen who settled in the east of the province and who were originally of Irish descent. There is no predominantly Irish county in Nova Scotia, but the Truro area shows its Ulster heritage in many ways.

The French, whose numbers are increasing rapidly, are still concentrated in the areas in which the returned exiles and a few fishermen settled many years ago. The counties with the largest percentages of French people are: Richmond, 58; Digby, 49; Yarmouth, 41; Inverness, 24; and Antigonish, 23. No county, however, has over 60 per cent. of its population of French descent; some have as low a percentage as 2. The German and Dutch elements in Lunenburg, namely, 27 per cent. and 16 per cent. respectively, and Queen's Counties, 5 per cent. and 7.1 per cent. respectively, are still apparent from the census returns. But it is very noticeable that the racial groups which have preserved their own languages—i.e. the French and the Gaelic Scots—are the ones which have retained their identity to the most marked degree. Also, these well-defined racial groups are confined to rural counties, except in the case of Pictou, and there the Highland Scots are predominantly rural.

THE HIGHLAND SCOTTISH SETTLEMENTS IN NOVA SCOTIA

The accompanying maps show the predominantly Scottish counties of Nova Scotia and the distribution of the Highland Scottish settlements within those areas. In each of the counties Pictou, Antigonish, Victoria and Inverness, over 55 per cent. of the population is of Scottish descent, and although the adjacent counties also have a considerable number of Scots, in none of them is the percentage over 40. From a study of the census returns, it is not possible to distinguish the Highland Scots from the Lowland Scots, but an examination of the region and a study of its history establishes beyond question that the vast majority of the rural Scottish settlers are of Highland descent. They are, in

Map of Nova Scotia showing urban settlements, rural Scottois, and French rural areas. The map includes labels for major locations like Cape Breton, Sydney, Victoria, Inverness, Richmond, Isle Madame, Guysborough, Antigonish, Pictou, and Halifax. A legend in the bottom right corner defines symbols for urban settlements, rural Scottois, French rural areas, county boundaries, railways, and mining areas. A scale bar at the bottom indicates distances in miles.

Fig. 2. Highland Scottish settlements of Nova Scotia.

fact, descendants of the original immigrants who landed here between 1773 and 1838.

A Scottish rural settlement in Nova Scotia can be defined as one with at least 70 per cent. of its population of Scottish descent. Similarly the French rural settlements have at least 70 per cent. of their population of French descent. The figure 70 was chosen because in both cases statistics for the individual settlements showed a definite break below that figure, sometimes falling to as low as 20, in which case a different ethnic group was found to be dominant. Both the French and Highland Scottish communities retain their own languages and cultures and are strongly concentrated into their respective racial settlements. Thus the six French rural settlements in these four counties contain 73 per cent., i.e. 5506 people, of all their French rural population; and the 68 Scottish rural settlements contain 80 per cent., i.e. 24,284 people, of the rural Scots. It is of interest to note that the French settlements are found in the Roman Catholic county of Antigonish, and also in Inverness which has distinctly separate Protestant and Catholic areas. There are no French settlements, however, in the Protestant and largely Presbyterian counties of Pictou and Victoria. As the French settlements are older than the Scottish, it may be that the Presbyterian immigrants preferred not to settle near the French districts, while the Roman Catholic Scots would not presumably have entertained any such prejudice. It is known that Catholic settlers who landed at Pictou moved on into Antigonish county from an early date. The number of French settlers, however, would have been actually and relatively much smaller 150 years ago than it is to-day. At present the French element in Inverness and Antigonish is increasing rapidly, although it is exclusively rural, and in both counties it now constitutes one quarter of the total population. The Scottish element, on the other hand, is declining and it is largely from the remote Scottish rural areas that most depopulation is proceeding. These trends are the same as for the Maritime Provinces as a whole.¹² The few mixed settlements are mainly groups of people of varied British descent, including some Loyalists and a number of people from Newfoundland.

The physical environment of this part of Nova Scotia is not the most favourable within the province.¹³ There is a considerable proportion of high land with extensive plateaux of over 1000 ft in the northern part of Cape Breton Island. Steep slopes are frequent, especially around the coasts, and the indentations of the drowned shores of the Bras d'Or lakes make land communications very tortuous and difficult. Glaciation has exposed huge areas of bare rock or else has deposited coarse morainic matter which is of little help to cultivation. In addition there are many lakes and numerous streams. The natural vegetation of the entire region is a dense forest growth, mainly of coniferous trees, with black spruce predominant. The regenerative powers of the latter are so vigorous that, unless cleared land is kept in constant use, these trees re-establish themselves within less than a decade. The climate is rigorous but invigorating. Winters are cold and often foggy with much snow, and although the summers are pleasantly warm, the abundant precipitation is distributed throughout the year.

The distribution of the original Highland Scottish settlements could not be very closely related to the detailed features of either relief or soil, because the flood of immigrants who arrived in the early nineteenth century had simply to settle where they could. The coastal and more accessible locations were naturally occupied first, and later arrivals were obliged to push into the interior and into the hills. It is from such upland settlements that wholesale depopulation has taken place, and on many hillsides to-day a dark patch of new spruce forest is the only indication that within 150 years that area has been cleared, settled, abandoned, and covered once more with a natural forest growth.

POPULATION CONDITIONS IN THE SCOTTISH COUNTIES OF NOVA SCOTIA

	<i>Cape Breton Island</i>		<i>Mainland</i>	
	<i>Victoria</i>	<i>Inverness</i>	<i>Pictou</i>	<i>Antigonish</i>
Total population	8,028	20,573	40,789	10,545
Density per square mile	7.3	14.6	36.3	19.5
Total rural population	8,028	15,920	16,345	8,388
Rural density per square mile	7.3	11.3	14.5	15.5
Percentage rural population	100	77	40	80
Total number Scots	5,328	12,443	24,256	5,812
Percentage of Scots	66	60	60	55
Scots percentage of rural population	66	58	70	53
Total number French	201	4,958	2,315	2,388
Percentage of French	2	24	6	23
French percentage of rural population	2	28	4	27
Total number rural settlements	20	24	37	18
Total number Scots rural settlements	15	16	28	9
Total number French rural settlements	0	3	0	3
Total number Mixed rural settlements	4	4	8	5
Total number Indian Reserves	1	1	1	1

From the above table it can be seen that all the Scottish counties, except Pictou, are predominantly rural, but the rural areas of Pictou County have the highest percentage of Scots for the whole region. Victoria County is exclusively rural and, therefore, the percentage of Scots for the county and for the rural areas is the same. Both in Inverness and in Antigonish the percentage of Scots for the rural areas is slightly lower than for the whole county. This can be explained by the presence of French settlements within those counties which are exclusively rural.

Although each county has its own distinguishing features on account of its natural resources, its location and its population structure, nevertheless the rural Scottish settlements have much in common throughout the region, the chief differences being between the mainland and the island counties. The first general characteristic of the Highland Scottish settlements is that they are all rural in character, whether they are entirely dependent on agriculture or not. A second general feature is the remarkable degree to which they have retained their

individuality. The retention of their own language, culture and traditions is a feature common to all Gaels, and with a population of predominantly Highland descent it is not surprising that Gaelic is being fostered and encouraged in Nova Scotia to-day. The Highlanders of Cape Breton are remarkably similar to the Hebrideans in many ways: it seems that with a rugged and inhospitable environment common to both—but with important differences of climate and vegetation—one hundred and fifty years in the New World have made no impression, whatsoever on the Highland temperament. A third general characteristic is a religious one, in that the Protestant and Roman Catholic communities are usually separate from each other. On the mainland this is on a county basis, Pictou being Protestant and Antigonish Roman Catholic, but in Cape Breton Island it is merely a difference from district to district. This fact cannot be said to have any great economic or political significance, for that admirable Canadian quality of tolerance seems to have permeated even the most remote corners of the country.

In Cape Breton Island, relief, climate and inaccessibility are all important controlling factors, and with present-day standards of living, it is very unlikely that either county could again support the population which it held in the early nineteenth century. The general economy of the Cape Breton Highland settlements is remarkably similar to that of the West Highlands of Scotland. The farms, like the crofts, provide a home rather than a living, and part-time work is vitally important. Some of this, namely, road work, lobster fishing and the tourist trade is the same in both areas. Nova Scotia also has valuable forests and the holdings there are larger, because they include not only the farm wood-lots but also all the grazing land, since the farms are owned, not rented, and there is no grazing land that is used in common. In both areas the same crops are grown: oats, hay and potatoes. Similarly, stock farming, mainly in the form of dairying in Nova Scotia at present, is more important than cultivation. The Scots in Cape Breton, with the exception of the 'Barramen' of the Grand Narrows district, are all landmen and have not interested themselves in deep-sea fishing, in spite of the proximity of the rich Newfoundland Banks. This industry is centred in the French or Newfoundland settlements of Cape Breton, whereas the Scots have confined their attention to inshore fishing, especially for lobsters.

There are considerable differences between Victoria and Inverness, but they have no great influence on the Scottish settlements. While Victoria is exclusively rural, in Inverness one quarter of the population is urban. The urban areas, however, which are mostly concerned with coal-mining, notably Inverness itself, are very small and are declining in size and in importance. Port Hood and Port Hawkesbury have already reverted to rural status, and Inverness may have to follow in due course. The proportion of Scots is not as high in Inverness as in Victoria, on account of the French rural settlements of the former.

In the Scottish rural settlements of both counties the individual farms are usually small mixed farms of between 100 and 200 acres, and if possible, they extend from a river up to the mountain sides which are

heavily wooded.¹⁴ The crops grown are grass and hay nearest to the river and farther, oats and potatoes, possibly a little wheat, and some turnips and vegetables. The acreage of sown grasses is increasing in an attempt to improve and encourage dairy farming. Between 10 and 20 head of cattle might be kept, perhaps the same number of sheep, 2 horses, a few pigs and some poultry. Farm work is only possible in summer here, lumbering and fencing are spring work, and in autumn, fuel is gathered for the long severe winter. It is the hardwoods which are used for fuel, since the softwoods, especially spruce and fir, are sold off the farms either as lumber or for pulp-wood. At the slack times of the year, i.e. after sowing and during the winter, the young people may seek temporary work elsewhere, which, from Victoria County, is often in the form of unskilled work in the mines around Sydney. As these farms are largely of a subsistence type, they do not provide an adequate cash income to support a family; as a result many have been abandoned and others turned over exclusively to grazing. When vacated lands cannot be sold, they are bought by the Nova Scotian government, which in consequence is a considerable land-owner in both these counties. Two examples from Victoria County will illustrate the land use problems involved in connection with these abandoned farms.

In the valley of the Baddeck River there was once a score of farms of between 150 and 300 acres in extent. All were the property of Highland Scots, and the farms stretched on both sides of the river for a considerable distance. To-day, only three are still farmed and occupied, ten have become government property, and the rest have been abandoned. In this valley, sheep farming is being encouraged, but it is necessary to stock the abandoned land at once or the trees will take control. Not far from the Baddeck valley is the Middle River district where the valley settlements are still farmed. The higher back-land farms, however, have been vacated and have reverted to woodland, the farmers having either moved down to vacant plots in the valley or left the district altogether.

An even greater degree of depopulation has occurred in the real 'mountain' settlements, especially in Inverness County. At South Highlands for example, near Inverness, there were 40 families only 25 years ago, but now it is utterly deserted. A similar situation has arisen at Lewis Mountain and Campbell Mountain farther south. Many former roads are now quite useless and abandoned, and only a handful of settlements remain. Much of the west coast from Creignish to Port Hawkesbury has also been deserted, and there has been large scale emigration to Boston and Detroit.

In the more accessible and more fertile areas, as around Mabou, Margaree, Middle River, the southern parts of Inverness County and the wide 'intervale' areas of the lower river valleys, there are large and quite prosperous farms of up to 400 acres in extent. Most of these are specialised and mechanised commercial holdings, more akin to the mainland farms than to the ones described above. In spite of much government aid and financial assistance, rural depopulation continues in the Scottish counties of Cape Breton, and the population structure is becoming increasingly unbalanced. It is now considered that the

best use of the good land is for dairying and vegetable production, and of the more remote and vacated lands, for sheep farms and for the scientific exploitation of the timber. As in the Hebrides, however, the Highland Scot of Cape Breton is not attracted by a commercialised economy and he is very loath to give up his traditional highly independent way of life, depending partly on his own produce and supplementing his income by part-time work when and as it suits him.

The contrast between the island and the mainland is very marked, for on the mainland the change over from a pioneer domestic economy to a commercial one is now complete. Conditions for commercial agriculture are certainly much more favourable here. In addition to the natural advantages of lower, more fertile and more accessible land, the farmers have co-operated for marketing and transport purposes, and there is now a considerable degree of specialisation and much mechanisation. Both counties supply industrial districts, Pictou supplying its own, and Antigonish sending its produce to the Sydney region.

In Antigonish the conditions are somewhat comparable to Inverness, as there is only one town, Antigonish, and there are also three French rural settlements. Antigonish, however, is not a mining town but a Roman Catholic ecclesiastical and educational centre and the seat of St Francis Xavier University. In the rural areas Antigonish has the best land in all four counties, the densest rural population, and the best organised and most prosperous agriculture.¹⁵ The latter features are due largely to the success of the co-operative movement which has been actively encouraged by the extension department of St Francis Xavier University. As in Cape Breton, the remoter Scottish areas are being depopulated and the land is reverting to forest. The good lands, however, are being well farmed and there has been a certain amount of resettlement here from the abandoned upland regions. Livestock are the mainstay of the agriculture of the county, with the emphasis on cattle, both dairy and beef, and also sheep. Many farms have 40 acres of grain and hay, but very few grow large quantities of fruits or vegetables. Most farms are family farms; a few employ hired labour, including some of the recent immigrants into the county. With the aid of government loans and grants, some Dutch immigrants are now buying farms in this county and are following the traditional farming practices of the region. The amount of timber here is much less than in Cape Breton; it is relatively unimportant as a source of income but is still very useful as a source of fuel.

Pictou County is the only one of the four Scottish counties to have a large urban population. This is concentrated into the New Glasgow¹⁶ industrial district, including the towns of New Glasgow and Trenton which are industrial in character, and Westville, Stellarton and Thornburn which are mainly mining centres. The Scots of Pictou County are less exclusively Highland than in the other counties, as it was settled from many parts of Scotland, including the Borders and Dumfriesshire. It was the receiving area for the majority of the immigrants, but otherwise its early history is not unlike that of the remaining counties. In common with Victoria, Pictou has no French rural

settlements and it is practically exclusively Protestant. For many years there has been a draining of people away from the mountain settlements, and the farms on the lower-lying land have become increasingly mechanised and specialised. They range from 100 to 300 acres in extent, with wood-lots in addition. They may have as much as 100 acres under crops and pasture, and they concentrate on fluid milk production for the creameries. Scotsburn is the focus of an important dairying region. Cream and hogs are the main saleable products from the farms; poultry farming and vegetable production are increasing rapidly.

CONCLUSION

An examination of the population and settlement conditions in Nova Scotia to-day shows the influence of its complicated history very clearly indeed. This is seen both in the racial composition of the population and in the distribution of the varied ethnic groups. Some of these groups, notably the French and the Highland Scots, have retained their individuality to a very remarkable degree. This must be attributed largely to the great strength of their respective national ties and not merely to the isolation and rural character of their settlements. Other contributory factors have undoubtedly been the virtual cessation of immigration to Nova Scotia, especially to the rural areas, during the last hundred years and the peninsular nature of the whole province. The immigrants who have settled in Nova Scotia within the last century have been attracted mainly by urban employment in the mining and industrial areas and in the commercial port of Halifax. Consequently these areas are the most cosmopolitan in the province.

The present-day distribution and density of population for the province can be related directly to its varied natural resources. The changes which have occurred since 1871 reflect the transition from a domestic to a commercial economy. This has resulted in much rural depopulation from the poorer and remoter districts, in an increase in the urban population, and in large-scale emigration. Within the last twenty years, however, difficulties in emigrating have been responsible for a considerable general increase in population, even in some rural areas, which has often been accompanied by serious unemployment. This has been felt particularly in the more remote areas where opportunities for employment are few and where a true subsistence economy is no longer either practicable or profitable.

The rural areas of the four Scottish counties show these features very clearly, and at the same time they show the contrasts which can develop purely on account of the presence of different nationalities. The Highland Scottish settlements are all rural and none of them are fishing stations. The French settlements are also rural, but they are mostly coastal in location and often combine agriculture and fishing and certain crafts as well. The birth-rate in these settlements is much higher than in the Scottish ones, including the Roman Catholic Scottish ones. As the French are not disposed to emigrate, some of their settlements now show a considerable degree of congestion on the land.

In the Scottish counties of Cape Breton Island the paucity of natural resources, the general isolation and possibly, too, the conservatism of the islanders make it difficult to organise commercial enterprises on co-operative lines. In the mainland counties, however, a commercial economy prevails, and although there is still depopulation from the remotest parts, the best lands are all well farmed and a reasonable degree of prosperity prevails.

Thus perhaps the main lesson to be learned from a study of the population and settlement conditions in Nova Scotia, especially in the less fertile rural areas as exemplified by the Highland Scottish counties, is that although location, physical environment and natural resources are important factors determining the distribution and the density of the population, nevertheless the history of the settlement of the region and the corresponding ethnic structure of its population have been of equal or of greater importance in determining its regional economy.

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¹ CAMPBELL, G. *History of Nova Scotia*. 1948.

² ROSS, W. C. A. Highland Emigration. *S.G.M.*, 1934, 50 (3): 155-166.

³ As described in Longfellow's poem "Evangeline"—a highly romanticised story of the expulsion.

⁴ The term *aboiteau* is still in use in this region to denote a sluice.

⁵ The majority, though not all, of the New England Congregationalists became Baptists. Acadia University, at Wolfville, is a Baptist foundation.

⁶ HARVEY, D. C. Scottish Immigration to Cape Breton. *Dalhousie Review*, October 1941.

⁷ MARTELL, J. S. Immigration to and Emigration from Nova Scotia. Public Archives of Nova Scotia, 1942.

⁸ DUNN, C. W. *Highland Settler*. University of Toronto Press, 1953.

⁹ *Census of Canada*, 1941.

¹⁰ HOBSON, P. M. Eddrachillis Parish. *S.G.M.*, 1950, 66 (3-4): 135-147.

¹¹ Report of Nova Scotia Economic Council. Vol. II. 1937.

¹² The Maritime Provinces in their Relation to the National Economy of Canada. Ottawa: Department of Trade and Commerce. Dominion Bureau of Statistics. 1948.

¹³ GOLDTHWAIT, J. W. The Physiography of Nova Scotia. [Canada. Department of Mines.] *Geological Survey Memoir* 140. No. 132 Geological Series.

¹⁴ PUTNAM, D. F. Farm Distribution in Nova Scotia. *Economic Geography*, 1939, 15: 43-54.

¹⁵ LONGLEY, W. V., and CHOWN, W. F. A. A Study of Land Utilisation, Farm Production and Rural Living. Antigonish County, N.S. Nova Scotia Department of Agriculture, 1936.

¹⁶ NICHOLSON, N. L. The New Glasgow Region of Nova Scotia. *S.G.M.*, 1953, 69 (2): 79-86.

SOME SCOTTISH RIVER CAPTURES RE-EXAMINED

III. THE BEHEADING OF THE DON

By DAVID L. LINTON

A MAP of the counties of Scotland shows Banffshire stretching irregularly south-westwards for some seventy miles from a frontage on the Moray Firth to a tapering extremity in the heart of the Cairngorm mountains; of this territory the innermost third is practically co-terminous with the drainage basin of the river Avon. This stream has a course of only 37 miles before joining the Spey near the foot of Ben Rinnes, but that course presents two sharply contrasted sections (Fig. 1). The upper section begins where the first headstreams plunge from the flanks of Ben Macdhui into the grim and lonely Loch Avon, and ends at the shooting lodge of Inchrory some 15 miles east-northeastward. This section is known throughout as Glen Avon and is essentially a valley of the mountains. At its upper end Loch Avon is impressively set in a deep glacial trough whose walls rise more than a thousand feet above its waters, and though the trough does not continue far below the foot of the loch and the rest of Glen Avon lies outside the high Cairngorms, it continues to be sternly overlooked by them on its southern side. This part of its course is sunk below a desolate moorland plateau, and in the twelve miles below the loch it falls fully 1000 feet to 1350 feet at Inchrory where we come to the first trees and the first inhabited house.

At this point the stream makes a great elbow bend, and forsakes the direction N 70° E which it has broadly held throughout the upper course for one which is immediately N 30° W for the next two or three miles and thereafter either a little west or a little east of north all the way to the Spey. This lower south-to-north section of the Avon differs from the upper in more than mere direction, striking though the change in orientation is. The first three miles below Inchrory have a grandeur almost the equal of anything seen farther upstream, but beyond this point the hills on either side become notably lower, the slopes gentler, the valley more open with haughlands and terraces graced by fields, woods and farmsteads. Below Tomintoul the valley is called Strath Avon. Nor is this all. Before it reaches the Spey, the Avon is joined by sizeable tributaries, of which the Livet and Lochy have valleys large enough to be called Glen Livet and Glen Lochy. Collectively we have here an area which is more cut up, where the hills are lower, and where the valley floors are wider and more open than is the rule hereabouts. If we wish, we may call it the Lower Avon Basin and recognise it as a compact lozenge-shaped area about a dozen miles from north to south, and eight from east to west, sharply bounded against the Ladder Hills to the southeast, less sharply towards

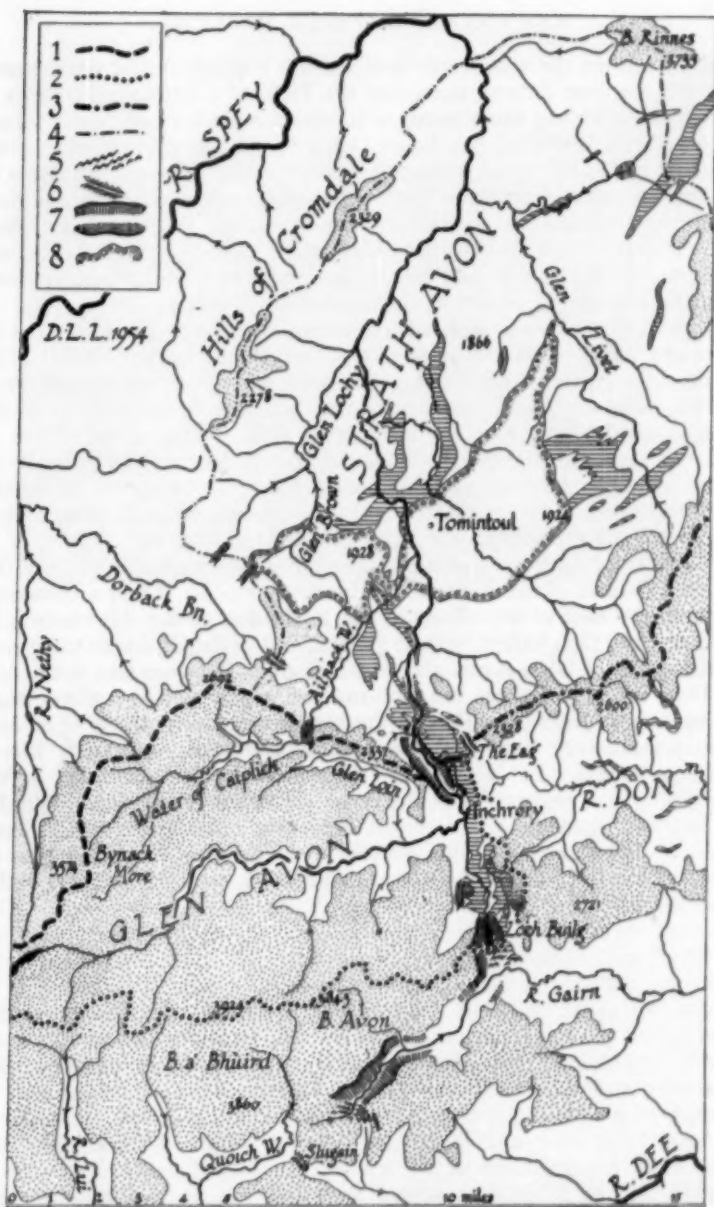


Fig. 1. The drainage system of the Banffshire Avon. 1. Course of the Avon-Don watershed before breaching. 2. Present watershed of the Avon above the Inchrory breach. 3. Avon-Don watershed where not affected by breaching. 4. Watershed limiting the Lower Avon Basin. 5. Morainic ridges. 6. Meltwater spillways. 7. Glacial breaches in pre-existing watersheds. 8. Limit of Old Red Sandstone outcrop. Limestone outcrop shown by horizontal ruling. Areas above 2000 feet stippled. [Based upon the Ordnance Survey Map, with the sanction of the Controller of H.M. Stationery Office. Crown Copyright reserved.]

Geal-Charn on the southwest, and having a single outlet northwards between the Ben Rinnes mass and the Hills of Cromdale. Now it is worthy of note that the sources of its streams lie very regularly along the southern limits of the basin, with two conspicuous exceptions. The first is the Water of Ailnack whose extension beyond the limits of the basin is so different from the rest of its course that it is quite understandably called by a different name—the Water of Caiplich [Caiplauch]; we shall return to this later. The second is the Avon. The impressive trough just below Inchrory and the whole of Glen Avon lie outside the limits of the Lower Avon Basin.

We have set down these details about the Avon drainage area in order to elicit the fact that even so brief an examination reveals it to be essentially composite, comprising two contrasted portions, Strath Avon and its tributary glens forming the one and the long upper glen the other, and that the two are articulated only by the great elbow at Inchrory and the three-mile reach of trough-like form immediately below it. The impression is conveyed that the two sections of the Avon have had different origins and histories and have become united as a single stream only in some geologically recent time.

This impression is strongly reinforced when we consider the further relations of the Avon at the Inchrory elbow. Only a thousand yards to the east of the elbow is the beginning of the Aberdeenshire Don, and the Don valley, both in general and in detail, forms the direct continuation of Glen Avon above the elbow. Between the Avon and the Don, moreover, there is a well-marked gap in which is the cottage of Lagganauld, and the valley to the east of the gap is widely open and disproportionately large for the Don headstream, the Feith Bhàit, that now occupies it. These were the considerations which led A. W. Gibb in 1908 to suggest ¹ that the Avon above the elbow was originally the head of the Don, and they still point unequivocally to that conclusion. Gibb regarded the beheading of the Don as being due to river capture following "the southward growth of a tributary . . . of the powerful Spey, cutting back along the strike of the beds." The existence of outcrops of limestone and black schist striking more or less along the course of the Avon for about six miles below the elbow at Inchrory, and the contrast with Glen Avon which is cut mostly in granite, and with the Don valley which is markedly transverse to the outcrops of the schistose rocks, lend much colour to these views, so that it is not at all surprising that they were found acceptable at the time they were advanced. Peach and Horne in their classic survey of Scottish scenery of 1910 stated ² that "it has been clearly shown that . . . the Avon beheaded the Upper Don at Inchrory," and after this categorical pronouncement by the acknowledged authorities it was natural that F. Mort in a school text-book ³ of 1914 should use the beheading of the Don as a typical instance of river piracy. A. Bremner appears to be the only other writer who has discussed the beheading of the Don, and, writing in 1921,⁴ he too accepted Gibb's interpretation and speaks of "this obvious case of river piracy."

So the matter has remained down to the present day. But examination of the field evidence in 1948 and 1949 showed that the diversion



1. The Inchroary glacial breach from its southern end. Young, almost rectilinear slopes, gullied above and scree-mantled below, separated by a sharp break of slope from the rounded mature slopes of the upland. The screes are spreading on the aggraded floor of the trough. Landslips scar the distant slopes on the left.



2. The Inchroary breach from the south, looking beyond Inchroary and up Glen Bulg. The trough floor at 1200 feet is 800 feet below the Foal's Craig on the left. Note the detrital cones that have been thrown down in post-glacial time on the trough floor.



3. The outlet gorge of the Caiplich, looking southward into the abandoned section of the Caiplich-Loin valley beyond.



4. The elbow of the Caiplich. Note the rock-floored, peat-covered section of the old valley with reversed drainage tumbling some 30 feet into the incised channel of the Caiplich.

of the former Upper Don at Inchrory possesses many features in common with the diversions of the Upper Geldie to the Feshie and of the Tarf to the Tilt. These two cases have already been discussed by the present writer in the pages of this *Magazine*,^{3, 4} and it has been shown that in both, the operative factor in causing the diversions has not been the persistent piecemeal encroachment of one river on the territory of another that we envisage as leading to the phenomenon of river capture or piracy, but the relatively sudden and catastrophic breaching of a former watershed by ice which began by overriding a divide and ended by creating a breach in it so large and deep that after the Ice Age the waters could no longer return to their pre-glacial courses. It has thus become necessary to re-examine the problem of the beheading of the Don and to decide, as far as may be, whether the diversion has been effected by normal river piracy or as the result of watershed breaching by ice.

INADEQUACIES OF A HYPOTHESIS OF STREAM CAPTURE

If we attempt to re-state the case advanced by Gibb nearly half a century ago, but in the more rigorous terms that would now be demanded, we encounter two sets of difficulties. One set relates to the advantages which favourable geological structures may be supposed to have conferred upon the piratical Lower Avon; the other set is concerned with the dating of the capture. We shall consider both in turn.

Inchrory is one of those relatively rare places in the interior Highlands where the almost ubiquitous heather gives way to green grass enriched by a calcicolous flora marking the presence of limestone. This rock is extensively exposed, together with the associated black schists, in the bold crags that overlook the Avon from the east below Inchrory, and for a mile or two their line of strike parallels the stream. It was natural for Bremner to claim solution of the limestone and facile erosion of the "soft Black Schist" as the pre-disposing factors allowing the headstream of the Lower Avon south of Tomintoul to break through the high watershed and pirate the waters of the Upper Don beyond.

In a general way there is no doubt that these rocks are rather more susceptible to erosion than the run of siliceous Highland rocks. But there is room for doubt whether they are so much more susceptible that this factor alone would lead to the incursion into the Don basin that we have to envisage. The limestone and black schist of Inchrory lie at the southern extremity of a belt of country running through the heart of Banffshire to Keith in which these rocks outcrop in continuous and sometimes broad bands in alternation or close juxtaposition with elongate masses of quartzite. The circumstances are such as might lead one to expect the development of topography of Appalachian type by the opening up of strike lowlands on the limestone and black schist outcrops leaving the elongate quartzite masses in relief. That the topographic evolution has been of this sort even a cursory inspection of the relief map will show; but it does not appear to have advanced

very far. Some valleys can certainly be found which have developed by extension along limestone and black schist outcrops, and notably the furrow which carries the road B9009 south-westwards from Keith up the Isla to Dufftown and so on up Glen Rinnes and down the Burn of Tervie into Glen Livet. Parallel to this and four or five miles south-east of it is a shorter furrow opened up by the opposed headstreams of Glen Fiddich and Glen Livet. Now it is noteworthy that both these furrows are crossed by the watershed that runs northwards from the Ladder Hills through Cook's Cairn (2478 ft) and Corryhabbie Hill (2563 ft) to Ben Rinnes (2755 ft). These are the culminating heights of this part of Scotland, and the watershed that runs through them crosses our two furrows without appreciable deviation, a fact which surely suggests that though the presence of the limestone and schist leads to marked lowering of the crestline, it has not led to any appreciable migration of the watershed.

We should, therefore, pause before we assume that similar geological circumstances south of Tomintoul led to a strikingly different result involving actual migration of the watershed by some miles. And we should find further ground for this hesitation in the fact that many of the streams of the region still flow in courses quite as unfavourably placed as the Avon-Don, and show no signs of being ousted from these positions by younger streams growing up along the strike of the weaker rocks. The Livet and its headstream the Ladder Burn flow directly across the strike and across what might *a priori* be regarded as harder and softer rock outcrops from the Ladder Hills to the lower Avon, which then continues this transverse course to the Spey. The Conglass Water repeats this behaviour a few miles to the west, crossing in turn quartzite, mica schist, black schist, Old Red Sandstone, limestone, quartzite, limestone, and mica schist before reaching the central Highland granulites and the Avon. And arrestingly and paradoxically enough, this section of the Avon is for seven miles an undoubted strike stream but lies two or three miles beyond the most westerly limestone and black schist outcrops and wholly in the siliceous granulites.

It comes to this. It may be taken as a fact that the lower Avon has annexed the head of the Don to give the present composite stream, and it is certainly a fact that the connecting link just below the elbow at Inchroary is a strike reach developed in some of the softer rocks of the region. This link was made at some time in the geological past, and the manner in which it was effected can now be only a matter of inference. The obvious inference that the run of the rocks is a sufficient cause for the stream capture is the one made by Gibb and by Bremner. But our examination of the extent to which the same rocks in similar situations have been able to facilitate stream extension elsewhere in Banffshire reveals no development at all comparable with what we would have to suppose to have taken place at Inchroary. This can only be regarded as a grave weakness in a hypothesis of capture.

Other difficulties arise when one attempts to assign a date to the capture. Normal river capture leads to considerable downcutting below the elbow of capture because of the powerful increase in volume, and to rejuvenation in the captured stream above the elbow because

of the change in base-level to which it is working. Meanwhile the beheaded stream in the old valley below the elbow is virtually powerless to effect change. Hence the extent of downcutting at the elbow below the level of the old valley may be taken as a rough measure of the time that has elapsed since the diversion occurred. Gibb reckoned this difference as 200 feet and thought it "quite inconceivable" that so much downcutting could have taken place in geologically recent times; in fact, he seems to have thought that something like all Tertiary time would be necessary.

In actual fact, however, it is not clear that any part of the difference of level is to be properly ascribed to downcutting by the river following capture. The Avon valley at and immediately below Inchroory is a deep glacial trough which is continued southwards above Inchroory by the tributary Glen Builg. Glen Avon enters this trough at the Linn of Avon from the western side as a narrow and more or less V-shaped valley which, however, has glaciated *roche moutonnée* forms to the bottom. Similar, but more conspicuous, *moutonnée* forms characterise the opposite slope up to the gap at Lagganauld which leads to the Don. There is, in fact, nothing in all this which can safely be ascribed to the work of rivers. If capture be supposed to have taken place here, it must also be supposed that the features which could be recognised as the immediate consequences of capture have been modified to the point of obliteration by the passage of ice. Bremner partly recognised this and concluded that "the capture took place long before the Ice Age".

Unfortunately for this view, however, there are signs that the diversion is very recent. The slopes of the section of the valley below Inchroory are broken at a few places by gullies whose scarred walls are clearly new features cut in the smooth slopes that surround the gully heads. The recency of these features is attested by the fact that in at least one case the incision has yet to work back to the head of the burn, and by the size of the detrital cones which are spread out on the flat aggraded floor of the Avon trough. These cones are clearly post-glacial, but they contain enough material to account for all the material removed from the gullies now visible. In other words, there is no sign of an early rejuvenation of the lateral tributaries such as might be expected to have followed a pre-glacial river capture, but clear evidence of rejuvenation in post-glacial times following considerable enlargement or modification of the valley by ice. These considerations are admittedly not fatal to a hypothesis of normal river capture. But when we reflect that if capture has taken place we must suppose it to have been followed by glacial modification of the valley so extensive that all the expectable features resulting from river capture would have been destroyed, and recall that all the features now visible in the field are either features produced by the ice or minor post-glacial modifications of them, it surely becomes imperative to ask whether the available facts are not most simply explained by assuming that until glacial times the watershed between the Lower Avon and the Avon-Don was intact and that the present breach below Inchroory was created by the ice itself.

FEATURES OF THE INCHROY BREACH

In the first article of this series ⁵ we discussed the several features which may be regarded as expectable in situations where a watershed has been overridden and breached by ice. They may be briefly recapitulated here: replacement of the pre-glacial col by the glacial trough with marked discordance of form and break of slope between the trough walls and the surrounding topography; maximum depth of the trough and maximum altitude of the break of slope at their intersections with the former watershed; lowering and upstream migration of the waterparting; marked rejuvenation of lateral tributaries, some of which may be partially dismembered and/or make upstream junctions. All these features may be recognised in the anomalous section of the Avon valley immediately below Inchroy.

As we have seen, this section is anomalous in that it links two well established drainage areas which have otherwise nothing in common, across what is elsewhere a well-defined watershed. Eastwards this watershed follows the county boundary to the limit of the Ladder Hills; westwards it runs—except for the Caiplich gap to be later discussed—to Bynack More and the Cairngorms. Its form is best seen in its eastern development. Streams take their rise at frequent intervals and descend northward and southward into deep polycyclic combe-like valleys whose growth has resulted in a lowering of the watershed opposite each. A traverse along the watershed thus reveals an alternation of broad swelling summits and smooth shallow cols or saddles. The altitudes of the latter proceeding eastwards from the Avon are approximately 1920, 1950, 2100, 2100, 2260, 2090, 2300, 2450, and 2475 feet. To the west we have a similar succession at 2100 (2000), 2450, 2180, 2300, and 2100 feet. (The figure in brackets refers to a col that has been replaced by the Caiplich gap.) The inherent contrast between these saddles which are all essentially features of the pre-glacial landscape and the deep trough of the Avon is well revealed by their contrasted altitudes. The floor of the Avon trough is at 1240 feet.

Not less striking are the contrasts of form (see photograph). The Avon breach is an almost rectilinear trough about $2\frac{1}{2}$ miles long from Inchroy to Dalestie. Its walls are rough and ungraded with bold crags above and long screes below, and strikingly discordant with the smooth slopes into which the trough is cut. The width of the trough from brink to brink is about 600 yards at each end but widens to almost 1000 yards in the middle. Here the break of slope reaches a culmination on each side—2046 feet at the Foal's Craig on the east and 2000+ feet on the west—where the trough walls intersect what is elsewhere the water-parting. At this point the trough is 800 feet deep.

Two small tributaries on the eastern side are instructive. At the southern end of the breach is a little burn descending southwards between Foal's Craig and Càrn Bad a' Ghuail. Not only does it make a sharp upstream junction with the Avon but its course is virtually truncated by the trough wall. It has consequently cut a great gash in the shoulder of the trough to effect some adjustment and thrown down

a steep cone on the valley floor across which the road to Inchrory is maintained with difficulty, since each winter sees an extension of the gullying upwards and the downward washing of a new load of debris. Nevertheless, the gullying is so recent in inception that it has yet to reach the watershed.

At the other end of the breach is a little burn that descends to Dalestie or, rather, hangs above that place. It has etched out its valley along a line of junction between the limestone and a tongue of quartzite which builds a hog-back ridge separating it from the main trough. The outer slope of this quartzite hill is still much as the ice left it and unscarred by gullies, but where the quartzite outcrop ends, a gully has developed on the main trough wall and intercepted the head of our little burn. Its former course descending from the Foal's Craig, and tiny remnants of its former floor, can both be seen suspended at the top of the modern gully but cut off from their one-time continuations. Here we have a smaller parallel to the cases of the Allt na Maraig and Allt a' Chrochaidh which are remnants of a former upland stream which has been dismembered and tumbled into Glen Tilt.

Finally we may mention that the discordance between the trough walls and the rest of the topography is well exemplified on the western side not only by the gullies and their attendant detrital cones, but by a massive landslide scar about half a mile south of Dalestie, and the debris hummocks beneath it which are as yet but little diminished by all the erosive power of the Avon.*

LOCATION AND FUNCTIONING OF THE INCHRORY BREACH

It would thus appear safe to conclude that the reach of the Avon valley between Inchrory and Dalestie had no pre-glacial counterpart but is a true glacial breach punched through the watershed by ice in relatively recent times. Such a conclusion is, however, not wholly satisfying to the mind unless we can indicate why this should be the only breach in this watershed and why it should have occurred in this place rather than elsewhere. Yet it is not difficult to envisage some of the factors that pre-disposed toward transfluence of ice across the watershed at Inchrory. It may be noted, for instance, that the pre-glacial watershed between the Don basin and the Lower Avon basin made a sharp inflexion at the point where the breach occurred, running WNW on the western side and NE on the eastern. Put differently, we can say that the Lower Avon drainage here occupied a blunt salient that extended southward into the Don catchment and constricted it very severely. This salient no doubt arose because of the southward encroachment of the Avon and its tributaries at the expense of the Don, which was favoured by the wide extension of the relatively soft limestones and black schist, and possibly also of the Old Red Sandstone, within their drainage area. It thus appears that though these geological factors which were relied upon by older workers as a sufficient cause for river capture cannot, in fact, be regarded as having operated in that way, they were responsible for a general enlargement of the Avon basin and a diminution in the width of that of the Don which must

have been important factors in localising the breach when it ultimately occurred. This event would be determined by contrasts in ice conditions in the two areas. The Avon basin has no sources of ice supply of its own, no corries, troughs or upland gathering grounds, and is generally below 1500 feet with extensive widely open areas. The Don basin was abundantly supplied with ice from the northern corries of Beinn a' Bhùird and Ben Avon and from the troughs and uplands further west. It is everywhere relatively narrow, and is notably constricted at Garchory some ten miles below Inchrory. Hence, egress eastwards for the ice in the upper Don valley was unlikely to prove adequate to discharge all the powerful supplies pouring in from the west. Accumulation was certain to occur, and sooner or later the Don ice would become so thick that it would possess a downhill gradient across the northern watershed and into the lower-lying and ice-free Strath Avon. Overflow would commence at the most southerly col on the watershed, and this may well have been also the lowest one. Once begun, the breach evidently grew rapidly and monopolised the ice flow, and continued to do so till the ice melted away.

Here we may notice an additional factor which may have operated as a contributory cause of the main breach or have been a consequence of it. At Inchrory the Upper Avon to-day receives its most considerable tributary, the Builg Burn. Glen Builg is a glacial trough which looks as though it supplied a good deal of the ice that went through the Inchrory breach. At the head of the glen lies Loch Builg, perched on the watershed between Avon and Gairn and held in by moraines at both ends. It has so little catchment that, according to Hinxman,⁷ in spells of dry weather the loch level falls below that of the outlet to the Builg, and water seeps away to the Gairn through the gravel moraines at the other end. Yet despite its watershed position, its level, 1586 feet, is far below that of the rest of the Gairn watershed which for the next six miles to the east remains everywhere above 2000 feet, and westwards rises sharply to the ridge of Ben Avon. The loch, in fact, occupies a trough some 500 feet deep breaching the watershed, which allowed ice to pass from south to north from Gairn to Avon. This may at first seem surprising, but it is clearly testified by the presence of a deep spillway to the west of the Builg Burn but parallel to it—now occupied by the Allt Gaineimh—which carried meltwater northward from the slopes of Ben Avon at some later stage when Glen Avon was ice-free and the Loch Builg breach occupied by ice from the south. What was the source of this ice? A few miles to the southwest the Gairn takes its rise in a sea of moraines below the most southerly spurs of Ben Avon and on the *southern* side of the range of hills that elsewhere forms the divide between Gairn and Dee! Through this elevated divide the puny headstream of the Gairn now flows in a grand U-trough with walls that rise 900 feet on the western, and 600 feet on the eastern side. This is nothing less than a third glacial breach made by the ice issuing from the great corries of Beinn a' Bhùird and unable to find any useful outlet by the Slugain glen which leads down to Deeside because of the congestion of ice already occupying the Dee valley. The passage of this ice is marked by the roches moutonnées on the col

between the Quoich and the Gairn, and its waning phases are marked by the moraines that seethe in front of the entrance to the great U-trough, and by the spillway which carried meltwater southward into Gleann an t-Slugain.

A grand vista is thus opened up, through which we may discern the impressive progress of the ice from the southern side of the great peaks of the eastern Cairngorms. Debarred from moving eastward by Dee, Gairn, or Don, it flowed first over, and then through, three successive watersheds by the breaches of the upper Gairn, Loch Builg and Inchrory, to find ultimate relief by expanding into Strath Avon and Strath Spey.

THE DIVERSION OF THE WATER OF CAIPLICH

The story of the relations of Avon and Don is, however, not complete without some discussion of the remarkable course of the Water of Caiplich. For this stream, as we noted in an earlier paragraph, also rises far outside the Lower Avon Basin and enters it by a breach in the general line of watershed no less impressive than, though utterly different from, the great glacial breach below Inchrory.

The Caiplich has its headwaters on the eastern slopes of Bynack More (3574 ft) and once flowed eastward from it across what is now a plateau surface at 2000-2200 feet, toward the upper Don, of which, with the upper Avon, it then formed a principal headstream (Fig. 1). Later it became incised into the plateau, so that this old eastward course is now represented by a furrow which deepens from 100 feet or so in the west to more than 500 feet in the east where it joins Glen Avon. But the astonishing thing about this furrow, which is nothing if not continuous, is that only its upper half is occupied by the Caiplich. Half-way along it the Caiplich escapes from the furrow by an abrupt and quite extraordinary opening in the north wall from which it emerges on the other side as the Water of Ailnack in a valley so different that no one need wonder why it goes by a different name. And the remainder of the furrow is occupied by the Burn of Loin, which is something of a misfit in the deeper eastern portion known as Glen Loin, and is unquestionably the beheaded remnant of the stream that first cut the furrow. The question that calls insistently for an answer is rather how did the Water of Caiplich come to forsake this strong groove in the upland and pass through a mere cleft in one of its walls, a "window" Alexander Bremner called it, to become tributary to one of the streams of the Lower Avon Basin.

Bremner's own view was that the "window" had been opened up by one of the headstreams of the Burn of Brown "cutting back mainly along yielding Old Red Sandstone conglomerates and black schist with limestone bands," thus effecting a normal river capture.⁸ Because he could not find all the features that might be expected if a very recent capture had occurred here, he concluded that the capture of the Caiplich was effected in pre-glacial times. Further, since the Caiplich below the elbow is not now part of the Burn of Brown, he supposed that, during the Ice Age and as a consequence of the valley of that

stream being blocked by glacial debris, the Caiplich was turned into the Ailnack, "a small feeder of the Avon" which had been "pushing its headwaters back along incoherent Old Red conglomerates and threatening to behead the Caiplich-Brown." In other words, Bremner believed that the same processes that had, in Gibb's view, led to capture of the Upper Don at Inchroary, had also led to the capture of the Caiplich by the Burn of Brown, and that a second capture had been so nearly realised by the Ailnack that a blockage by glacial drift in the valley of the Burn of Brown had sufficed to bring about the completion of the task.

It is, however, difficult to believe in either of these captures. In the first case the capturing stream, the Burn of Brown, ran almost at right angles to the geological outcrops, in which mica schist, quartzite and quartz-schist predominate over the softer limestone and black schist: it is difficult to see in what way the Burn of Brown could be advantaged by this state of affairs. Nor is it any easier to perceive the advantages possessed by the Ailnack that are supposed to have led to the extension of its valley. Archibald Geikie long ago described the gorge of the Ailnack as "one of the most impressive ravines anywhere to be seen in Scotland . . . eroded to a depth of some 150 feet through coarse conglomerate and the underlying schists."⁹ Moreover, Geikie noted that the gorge must be of later formation than "the morainic gravel which is spread over the surrounding country and caps the cliffs on either side of the gorge." The latter must thus be a very young feature and certainly looks it.

The exit gorge of the Caiplich has all the appearance of being just as young. As photograph 3 shows, it is a rugged gash ripped in the solid rock some 150-250 feet deep, which the writer was unable to traverse at water level. Near the stream the cliffs are cut in fresh, hard, grey quartz-schist: at the head of the cliffs a hundred and fifty feet higher the same rock is highly disintegrated and strongly reddened. Clearly the slopes here had been deeply weathered long before the fresh rock was exposed in the gorge below. In the valley to the north this contrast is clearly visible in the topography which is of the type expressively called V-in-V. The steep-sided rock-walled gorge is cut in the bottom of an old, shallow and mature valley whose form is clearly testified on every spur. Here is no headward extension of a valley adjusting itself slowly and continuously to some favouring geological structure, but the abrupt cutting of a deep gorge in the bottom of a pre-existing and rather gently sloped and unimportant valley. The gorge cutting was evidently an event unconnected with the earlier development of the old mature valley, and one so recent that the older slopes have not yet adjusted themselves to the changed conditions. On both sides of the stream the cutting of the gorge has undermined the older slopes and caused them to founder in massive landslips.

Taking this evidence as a whole, there can surely be no doubt as to the origin of the Caiplich gorge: it is nothing else but a meltwater spillway gashed by a powerful torrent in the col that separated the Caiplich-Loin furrow from the gentle valley on the north that led

toward the Burn of Brown. The aspect of the spurs of this valley allows us to fix the height of this col as approximately 2000 feet before overflow occurred. This accords with the fact that the next col to the east is a peat-floored concavity at 2100 feet which was clearly not overflowed. We envisage the overflow being from a lake impounded in the Caiplich-Loin furrow by ice intruded into the lower end of Glen Loin from Glen Avon. Some confirmation of this is afforded by features which are taken to be strandlines on the slopes of Little Garvoun and Big Garvoun at 1900 feet, and two channels a little above this height on the north-east spur of the latter hill, cut by meltwater flowing northwards into the lake between the hill slope on the west and the impounding Avon ice on the east. Apart from these features and the great gorge opening northwards out of it, the Caiplich-Loin furrow appears little disturbed. The view of the elbow shown in photograph 4 is instructive. The peat-covered floor of the old valley is seen to left. The present divide between the Caiplich and the Loin is a corrom watershed at the first detrital cone down-valley, just outside the limits of the photograph. The little burn that flows from it can be seen wandering in the peat till it reaches the 30-foot solid rock bluff of the incised channel of the Caiplich. Over this it tumbles without appreciable incision. This section of the valley has remained virtually unchanged since the day when the lake was drained. Moreover, the latter event was clearly due to some spectacular down-cutting in the outlet gorge, for this had been cut below the level of the rock floor of the trough seen in the photograph before the alternative outlet became available by the melting away of the ice dam at the mouth of Glen Loin. So the outflow of the Caiplich through the gorge below the pinnacle known as the Castle became permanent, and adjustment of the stream to a new and lower baselevel continues. Upstream of the bend the peat-covered trough floor seen in the photograph is continued as a narrow but still peat-covered ledge. It seems unlikely that peat has formed in this well-drained position and we must conclude that the stream incision is here later than the peat formation. A nick-point is in process of migrating upstream.

Some indications of the conditions in which the overflow from Lake Loin first occurred can be deduced from the relations of the gorge of the Ailnack. The lower mile or so of this gorge is cut into the floor of a short side valley opening into the Avon just above Tomintoul. The upper part was regarded by Bremner, and probably correctly, as having been tributary to the Burn of Brown. Between the two sections the gorge cuts through a low col behind the rise called Druim na h'Easgainn. The integration of these two sections evidently occurred because egress by Glen Brown was impossible, and direct egress eastwards into the Avon at Torbain was equally so. Bremner saw in the drift in Glen Brown a reason for diversion of the Ailnack, but it seems more likely that ice was the barrier both here and to the east, so that the Ailnack had to flow north-eastwards by the only route open to it. Its course appears to have no relation whatever to the solid rocks below but to have been, in effect, superimposed upon them from the overlying drifts. The presence of ice to the west is well attested, for at about this

time meltwater was overflowing into the Ailnack from the recess in the hills at the head of the Dorback Burn in the Nethy drainage. As the front of the Spey ice melted back, this spillway went out of use, and Bremner has described¹⁰ how others took its place, first into Glen Brown, and then across the south-western spur of the Hills of Cromdale to the ice-free portions of Strath Spey.

While these changes were going on to the west of the Ailnack, the ice margin in the Avon valley was also being melted back, though doubtless more slowly, for, while the ice in Nethy Forest was far from its source and quite possibly stagnant in places, that passing through the Inchrory breach from Glen Avon and Glen Builg was being reinforced from mountain ice-fields close at hand. It will suffice to mention here some features displayed in the valley of the Burn of Little Fergie to indicate how matters stood. The Burn of Little Fergie runs a course of only a mile and a half from the main divide marked by the county boundary to the bend of the Avon just below Dalestie. At its head the watershed is notched by a conspicuous rock-walled channel which is evidently a spillway that carried meltwater away from the ice in the valley of the Don. (This channel is called, like many others of the same kind in the Highlands, the *Eag*, and the name might well be used with advantage, in descriptions of Scottish landforms, as a technical term to denote a dry channel notching a divide which formerly functioned as a spillway.) The *Eag* has an intake at about 1920 feet and descends to a level 200 feet lower, and terminates on the hillside above an accumulation of drift which the writer has had no opportunity to examine but which has the form and relationships of a dissected delta. The indications are that the waters of the *Eag* poured into a small lake hemmed in the Glen of Little Fergie by the Avon ice. Examination of the col on the north side of this glen shows without room for doubt that there was no overflow from the lake in this direction. It is a very smooth saddle at 1830-1840 feet, partly mantled by peat, and quite unmodified by meltwater. The latter must therefore have escaped over the ice in the Avon valley, and we thus learn that the ice surface at this time was no higher than 1600 or 1700 feet at the mouth of the glen. As the Avon ice melted away, the barrier became lower still and the lake shrank, allowing the waters from the *Eag* to channel their way down the hillside, bringing with them a heavy load of rounded granite and other cobbles. This load was piled up against the ice barrier across the mouth of the glen, where it may be seen to-day exposed in the scars on the steep hillside to a depth of fully 100 feet. A little later, the ice in the Avon valley melted back still further and the mouth of Glen Fergie became free. The Burn of Little Fergie, possibly still reinforced by meltwater from the *Eag*, immediately began to cut down through the great accumulation of bedded torrent gravel, and to-day has cut right through it to the solid rock below.

Here we must conclude. The incidents that we have just been describing in connection with the Caiplich, the Ailnack and the *Eag* at the head of the Burn of Little Fergie are among the latest whose effects are to be read in the forms of the present landscape. Probably

they occurred not more than 20,000 years ago, and it may come as a surprise to some to realise that features so striking as the Craigs of Ailnack or the Castle gorge of the Caiplich can be so young. Similarly, the breach in the watershed through which the Avon is diverted at Inchrory is far from being of (geologically) great antiquity. It is here taken to be wholly the work of ice and thus a feature having no existence till, probably, later Pleistocene times. We now see it as it was left by the ice of the last glaciation; but we would be rash to conclude that ice did not pass through it till then. The writer feels that there is some reason to think that after the Inchrory breach first functioned as an outlet for the ice of the eastern Cairngorms, the climate ameliorated and the weathering processes associated with interglacial conditions modified the relief in some degree before the ice of the last glaciation poured through the Inchrory breach and re-occupied Strath Avon.

It will be noticed that there is a considerable contrast between the views which are put forward in the present essay and those of the earlier observers, not merely in the matter of the interpretation put upon the specific features under discussion—the remarkable elbows of the Avon and Caiplich and their relationships—but also in the attitude that is taken up regarding the efficacy of several of the processes of earth sculpture. The older workers saw in the operation of ice an agency of considerable but generalised potency, wearing down, and in their view smoothing, the countryside as a whole. For the explanation of such localised erosive activity as had evidently turned the head of the Don into the Avon and the Caiplich Water into the Ailnack they had recourse to the operation of stream erosion guided by supposedly favourable geological structures, culminating in the achievement of river capture and requiring very considerable stretches of geological time. The arguments here put forward, however, lead us to think that ice can be highly localised in its operation, and that although the Avon and Caiplich breaches were cut by different media (ice and water), they nevertheless have quite a good deal in common. The Inchrory breach was carved by a powerful and localised stream of transfluent ice to afford relief to a large body of impounded ice for which there was no means of escape south of the Avon-Don watershed. The Castle gorge of the Caiplich was carved by a powerful and localised stream of overflowing meltwater to afford outlet to a large body of impounded water in Glen Loin for which there was no means of escape south of the Avon watershed. In both cases the point of first overflow was localised by the nature of the pre-existing relief, and it is in the production of that relief that the action of rain and rivers, operating over long stretches of geological time and guided by geological structures, has had its effect. In contrast to the action of rain and rivers, transfluent ice and overflowing meltwater are both extraneous and ephemeral forces, suddenly brought to bear at particular places—though these places have in fact been selected and prepared by the previous action of rain and rivers—and as suddenly removed. While they operate they can achieve spectacular results—the Inchrory breach we have seen is 800 feet deep, the Caiplich gorge more than 250—and this similarity of action strongly suggests that the draining

of an upland ice-field by transfluence has much in common with the draining of an impounded body of water by overflow. In the cases under review both overflows continued long enough for the new outlets to be lower than the floors of the valleys out of which they opened. They have thus become 'permanent' features of the landscape. Sixty square miles of the former Don catchment have been transferred to that of Strath Avon, and in those sixty square miles rain and rivers now operate in relation to a much lower baselevel than before. Again we note a contrast with the older views. These envisaged river capture occurring as the consequence of an advantage of baselevel possessed by the Avon and Ailnack: the present account suggests that the advantage of lower baselevel is a consequence deriving from the river diversions. And finally we may note the paradox that although the diversions of the upper Don and Caiplich have been in the nature of geomorphological accidents, they will, as the present erosion cycle continues, greatly facilitate that very process of adjustment of relief to geological structure to whose operation they were formerly attributed.

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¹ GIBB, A. W. The Relation of the Don to the Avon at Inchroory, Banffshire. *Transactions of the Edinburgh Geological Society*, 1910, 9: 227-229.

² PRACH, B. N., and HORNE, J. The Scottish Lakes in Relation to the Geological Features of the Country. In: J. Murray and L. Pullar, *Bathymetrical Survey of the Scottish Freshwater Lochs*, 1: 439-513. Edinburgh, 1910.

³ MORT, F. *The British Isles*. Cambridge: University Press, 1914. Pp. 52-53.

⁴ BREMNER, A. The Physical History of the Don Basin. *University Studies*, No. 83: 8-13. Aberdeen, 1921.

⁵ LINTON, D. L. Some Scottish River Captures Re-examined. [I. Diversion of the Upper Geldie.] *S.G.M.*, 1949, 65 (3): 123-132.

⁶ ——— Some Scottish River Captures Re-examined. II. Diversion of the Tarf. *Ibid.*, 1951, 67 (1): 31-44.

⁷ It is perhaps desirable to mention here that in his recently published book *Geography from the Air*, Mr F. Walker has reproduced as Plate 39 at a scale of about 1/16,000 an air photo mosaic of the elbow of the Avon at Inchroory. This can be quite helpful in following the present discussion even though the accompanying paragraphs of explanation (pp. 45-46) are couched in terms of Gibb's hypothesis of capture. The "gorges" referred to at E are in fact part of the east wall of the glacial breach, the "rejuvenation" of the Avon at F is merely post-glacial adjustment of the Avon to the fact that its trough was scoured less deep by ice than that of the Builg Burn, which at G is seen aggrading the floor of its trough. One of the features which Mr Walker's plate shows to advantage is the little burn which descends southwards from the Foal's Crag: immediately to the left of E its cone of light-coloured debris can be seen obliterating the road and encroaching on the river; above this is the big funnel cut in the trough wall, while running up into the dark-coloured heather of the upland are the first beginnings of the incision of its headwaters.

⁸ HINXMAN, L. W. Explanation of Sheet 75. *Memoirs of the Geological Survey, Scotland*. Edinburgh, 1896. p. 6.

⁹ BREMNER, A. *Op. cit.*, pp. 13-15.

¹⁰ GEIKIE, A. *The Scenery of Scotland viewed in connection with its Physical Geology*. London: Macmillan and Co. Ltd. Third edition, 1901, p. 196.

¹¹ BREMNER, A. The Glaciation of Abernethy Forest. *Transactions of the Edinburgh Geological Society*, 1934, 13: 1-17.



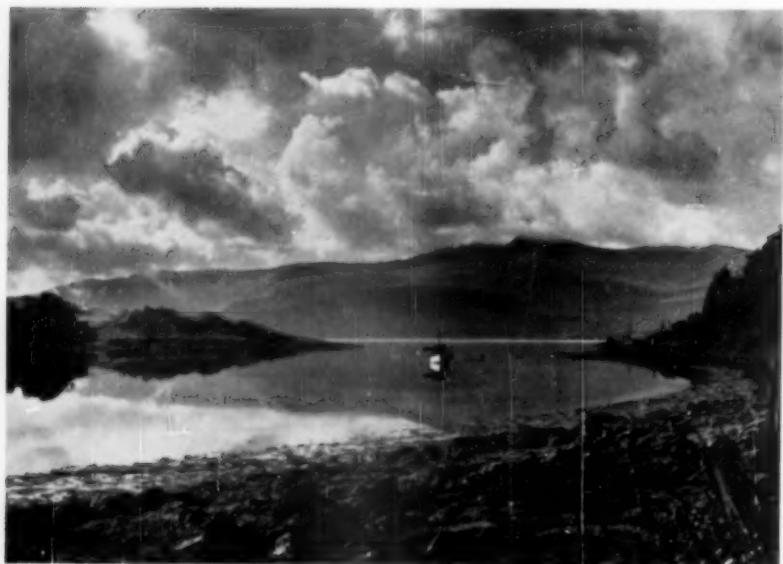
VIEW FROM BEN RESIPOL ACROSS LOCH SUNART AND MORVERN.
BACKGROUND: LOCH ALINE, SOUND AND ISLE OF MULL



LOCH TEACUIS, LOOKING NW. BACKGROUND: BEN HIANT



INNINMORE BAY AT BRAIGH RUDHA AN T-SASUNNAICH



LOCH ALINE AND SOUND OF MULL

THE PARISH OF MORVERN

By J. F. SCOTT

THE Parish of Morvern forms part of the peninsula lying SW of Glen Tarbert in NW Argyll. It is bounded on the north by Loch Sunart, on the south by the Sound of Mull, and on the SE by Loch Linnhe.

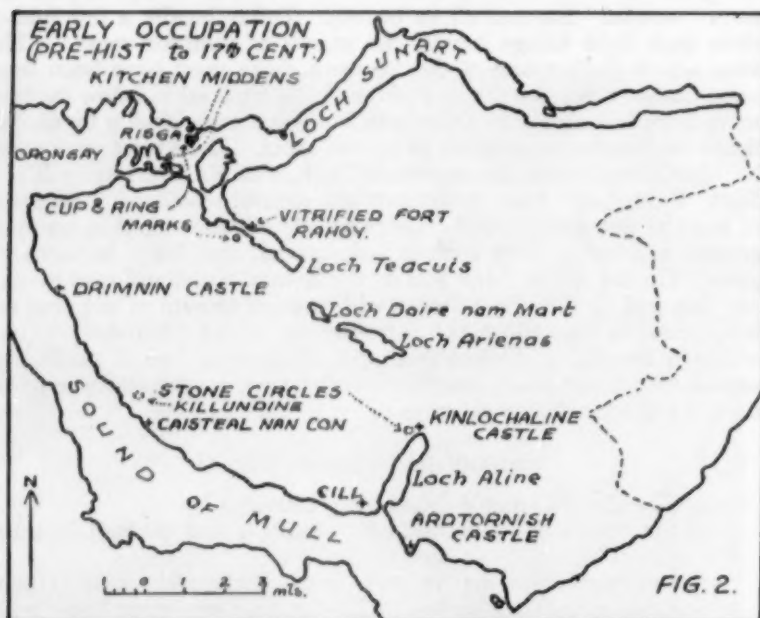
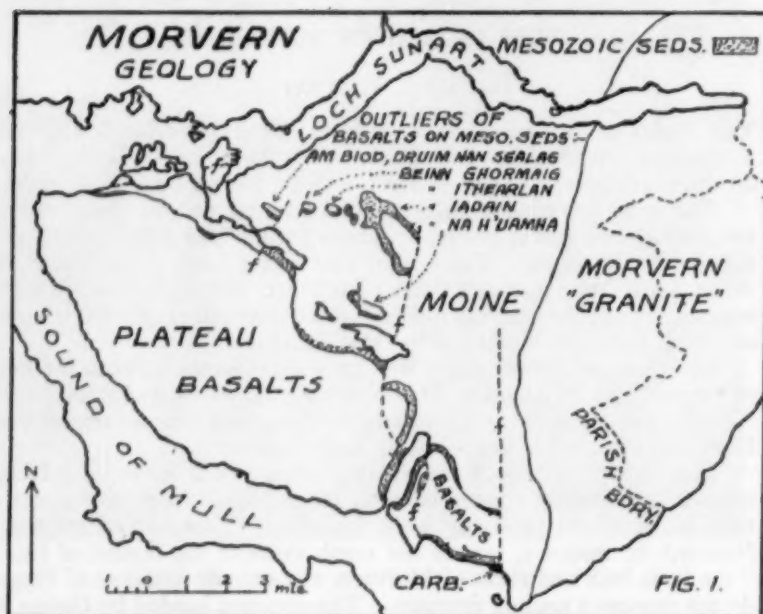
The most prominent topographical features are the deep valleys, the *Mór bheàrna* (great passes) or *Mhuir bheàrna* (sea gaps), which give the district its name.¹ The hollow containing Loch Aline, the River Aline, Loch Arienas, Loch Doire nam Mart, and Loch Teacuis forms a through valley eleven miles long, with a watershed only 70 ft above sea-level, and with hills on either side rising over 1800 ft.

Morvern, in ancient times, was known as Ceann Albann, the head or promontory of Alban.² It was the southernmost point of Druim Albann, the territory of the Northern Picts, and was separated from Dalriada, the land of the Scots, by Loch Linnhe.

Most early travellers were not impressed by the scenery, and their remarks are mainly concerned with its geology. Such comments as they make would probably have the effect of keeping others away. Necker,³ for instance, says of the north shore of the Sound of Mull: "the little hills and rocks of Morvern, the ancient domaine of Fingal, do not present a smiling prospect. This country, lauded by Ossian for the grandeur of its forests; this land to which he always applies the term 'wooded' has lost all its beauty. Today hardly a few bushes show their light foliage amidst the masses of tumbled rocks." The view which Necker had of the Morvern shore must have been from some distance, because the shore from above sea-level to below the lava scarp from Inninmore to Ardtornish Point is almost hidden by magnificent old beeches, sycamores, oaks, and ashes. These trees were noted by MacCulloch⁴ and are mentioned by him in his *Letters to Sir Walter Scott*. From Loch Aline to the west the natural woodland is certainly of more recent growth, and consists mainly of hazel coppices on open ground and larger trees such as oak, rowan, and birch in sheltered glens. On the side of Loch Sunart the natural woodland rises to over 500 feet and clothes the hillsides with a thick growth of oak, rowan, birch, and alder. Since the introduction of the 'big sheep' (i.e., southern breeds as distinct from the indigenous 'small cattle' or *meanbh-chrodh*), the yearly moorburn—often very drastic—has prevented the natural spread of forest trees.

SUMMARY OF GEOLOGY (Fig. 1)

- (1) The Pre-Palaeozoic foundation, intruded by
- (2) the Morvern (or Strontian) 'granite', and covered in some places by
- (3) sediments, varying in age from Carboniferous to Upper Cretaceous, these sediments having been preserved from denudation by
- (4) the Tertiary plateau basalts.



The sediments occur mainly as a fringe outcropping round the Tertiary lava plateaux and their outliers. Their outcrops, though of small areal extent, are important topographically, as they form an easily weathered foundation for the lavas, which form scarps only when the sediments are exposed. The only sediment that gives rise to distinct topographical features is the Triassic cornstone, which is much more compact than the rest. It forms a broad terrace with a small scarp at Achadh nan Gamhna, SW of Claggan, and again in the area NW of Beinn Iadain.

The rest of the parish consists of three areas of roughly equal extent, namely, (1) a central wedge-shaped area of Moine gneisses and schists stretching from Tòrr nan Coin in the NW to near Liddesdale on the NE and to Rudha an Ridire in the SE. In this area, to the N and NW of Loch Arienas, occur the outliers of Beinn na h'Uamha, Beinn Iadain, Beinn Itheartlan, Beinn Ghormaig, Am Biod, and Druim nan Sgalag consisting of Tertiary lavas overlying Mesozoic sediments; (2) a SW area of Tertiary lavas bordering the Sound of Mull from Inninmore of Ardtornish to Auliston Point, extending inland for a maximum distance of $5\frac{1}{2}$ miles and breached by Loch Aline; (3) an E area of Morvern 'granite' which extends outside the parish eastwards to Loch Linnhe and north to Bellsgrrove in Sunart. Its total outcrop is about 80 square miles, making it one of the largest intrusions in Scotland.

The hard resistant nature of the Moine rocks is reflected in the name applied to the central wedge by the Celtic inhabitants, viz., *Taobh garbh nam Morbhearna*, meaning 'the rough side of Morvern'. Hummocky hill masses are the rule in this area.

The 'granite' forms a multiple intrusion consisting mainly of biotite granite and porphyritic granodiorite. These types are generally coarser than the Moine rocks and are thus more subject to the action of weathering agents, give smoother contours, and show the effects of glaciation more markedly.

The Tertiary plateau basalts show typical trap-featuring and have a maximum thickness of over 1200 ft south of the Arienas-Teacuis valley. As already mentioned, they form prominent scarps when the underlying sediments are exposed. The weathering of the sediments, especially the Lower Lias limestone and shales, also causes great landslips, such as occur to the south of Loch Teacuis near Ard an Tiobairt. The outliers of the lavas give rise to 'basalt-caps' which stand out from the country gneiss because of their terracing, their different weathering, and their greener cloak of vegetation. Associated with the lavas are very numerous NW dykes which give a minor 'lineated' type of scenery and determine the course of many streams. They also cause many waterfalls when they cut across the bed of streams, e.g. the Eas Stangadail on the Barr River.

Faults play an important part in the development of the landscape. The Inninmore (Aoinidh Mór) of Ardtornish shows a series of three N-S faults; the main one—the eastern—has a downthrow of at least 1000 ft to the west and brings Tertiary lavas against Moine gneiss; the western one at Aoinidh Beag causes an interesting little valley with exposures of Mesozoic sediments at Fountainhead, curves NW across the head of Loch Aline, swings N near An Coire, and continues N to

form the eastern boundary of the Beinn Iadain basalt-cap. Other notable faults affect the outliers of Beinn na h'Uamha, Beinn Ghormraig, and Am Biod. The island of Carna is crossed by an E-W fault which may continue westward by Tòrr nan Coin to cause the cliff east of Auliston Point.

The Quaternary ice sheet passed over northern Morvern in a SW direction. The direction of flow changes to W in southern Morvern, the deviation being caused by the Mull mountains to the SW. The only glen that lay in the same direction as the ice-flow is Upper Gleann Dubh, which is markedly glaciated. The 'granite'-gneiss boundary has been emphasised by the ice because of the greater hardness of the gneiss. The junction thus tends to run in a hollow on the eastern side of the gneiss hills.

The 25-foot raised beach fringes most of the coast, and there are developments of two higher terraces.

CLIMATE

The only records for the district are taken at Ardtornish Towers at the head of Loch Aline and about 12 miles from the most westerly point. This station lies in a hollow, and ground over 1800 ft intervenes between it and open water. Thus the records cannot be taken as typical for the whole parish. For Ardtornish, maximum temperatures lie around 80° F. and may occur in June and early July. Minimum night temperatures may be as low as 23° F., and minimum day temperatures 36° F. These occur between December and February. Rain-fall is about 70 in. per annum, with precipitation of more than 1 mm. on over 180 days. Snow may fall, but seldom lies. No sunshine records are taken.

In the western part of the parish conditions are better, as the rain-fall is less and frosts are rare. On the whole, the driest months are March, April, and May when dry east winds are common. The rain-fall is fairly evenly distributed throughout the rest of the year by prevalent SW winds.

EARLY HUMAN OCCUPATION (Fig. 2)

Traces of early inhabitants are to be found in a 'vitrified fort' at Rahoy,⁸ kitchen middens on the Islands of Risga and Oronsay, 'cup and ring marks' on Risga and on the south side of Loch Teacuis, and stone circles at Killundine and Kinlochaline. The place-names are usually Gaelic, but Norse invaders have left their memorial in several, e.g. Coire Lunndie, Coire Bhorradail, Eas Stangadail, Strath Shuar-dail, Loch Sunart, Oronsay, etc.

More recent times are represented by several old castles on the coast, e.g. Ardtornish Castle, dating from the 14th century, Kinlochaline Castle (the Butter Castle), guarding the pass at the mouth of the River Aline, and Caisteal nan Coin (Castle of the Dogs), a hunting castle on the Sound of Mull about seven miles west of Loch Aline. The ruins of an old church (Cill Choluimchille) are to be found near the present Parish Church, in the graveyard of which stand a Celtic cross and the tombstones of many who dwelt in townships which are

now but heaps of stones. Legend has it that a Spanish princess, involved in the wreck of the galleon in Tobermory Bay, is buried here.*

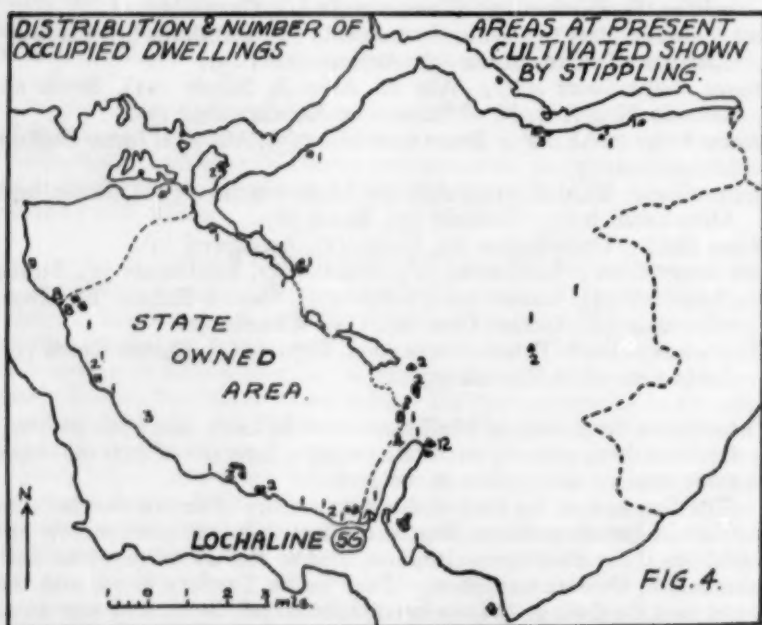
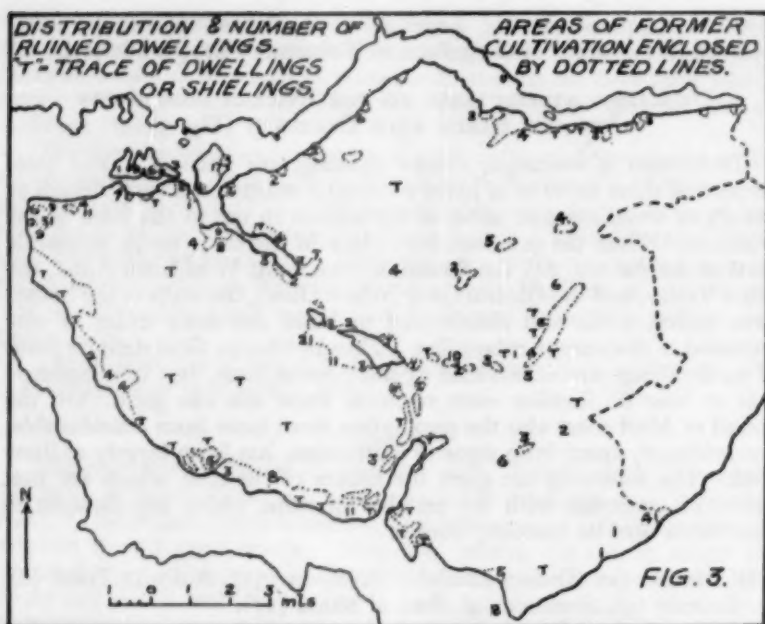
DWELLINGS ATTRIBUTABLE TO THE EVICTED POPULATION
(18TH AND EARLY 19TH CENTURY) (Fig. 3)

Distribution of townships, isolated dwellings and shielings. The chief purpose of these notes is to place on record examples of such details as remain of dwellings and areas of cultivation in use at the time of the evictions. When the evictions took place in the more easily accessible parts of the district, e.g. the Sound of Mull coast W of Loch Aline, the Aline Valley, and the Gleann Geal (White Glen), the walls of the houses were pulled down and either used to build dry-stone dykes or else scattered to discourage rebuilding. Thus in Gleann Geal definite ruins of 34 dwellings are observable at the present time, but it is believed that at least 60 families were removed from this one glen. On the Sound of Mull coast also the population must have been considerable, but evidence, apart from signs of cultivation, has been largely obliterated. The following list gives the names of the sites which are best preserved, together with the number of ruins which are thought to have been used as dwelling-houses.

- NW Morvern (on Tertiary basalts) ;* Auliston (31), Auliston Point (6), Carraig (9), Sruthain (4), Port a' bhata (11).
NW Morvern (on Moine gneiss) ; Oronsay (19), Sornagan (4), Druimbuidhe (?), Dorlinn (2), Gleannaguda (1), Carna (20).
Loch Teacuis ; Barr (4), Baile Geamhraidh (8), Carnliath (4), Cnocan-dubh and Torrancedhinn (9), Ardantiobairt (3).
Arienas Valley (south side) ; Allt an Aoinidh Mhoir (21), Srath an Aoinidh Bhig (11), N. of Sithean an Aoinidh Bhig (3).
Arienas Valley (north side) ; Doire nam Mart (3), Allt na h'Innse Cuilinn (2), Arienas (7).
Gleann Geal ; Uladail (12), Allt na Mucaireachd (3), Uileann and Alltachonaich (7), Clonlaid (5), Beach (6).
Gleann Dubh ; Croisbheinn (2), Lurga (5), Achagavel (4).
Loch Sunart Coast ; Loch-head (1), Achleac (3), Liddesdale (3), Strath (Laudale) (4), Camas na h'Airbhe (2), Camas Salach (6), Glencripesdale (2), Camas Glas (2), Caol Charna (2).
SE Morvern ; Loch Tearnait area (11), Eignaig (4), Camas Gorm (1), Inninmore of Ardtornish (5).

The sites on the Sound of Mull shore west of Loch Aline are omitted, as details of them are very uncertain owing to later use of their materials in more modern occupation of the area.

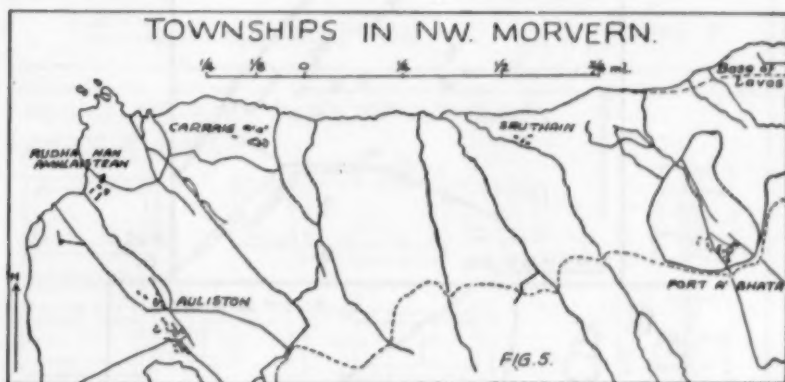
The first five on the list are the most worthy of description because they are in better condition, due to the fact that they were merely unroofed, to their more open situation, and to the use of more suitable materials in their construction. They lie on Tertiary lavas, and the stones used for their walls have been taken largely from shore exposures of the massive centres of lava flows. Such stones are capable of rough dressing and thus could be made to fit better into one another than



blocks taken from inland exposures where there is considerable overburden which leads to deeper-seated weathering. Thus many of the stones used at Allt an Aoinidh Mhoir on the south side of the Arienas Valley were taken from landslip and scree material and were already partly weathered when built into the walls. When the houses were unroofed, such blocks soon rotted and the walls crumbled.

Most of the remaining houses were built of local Moine rocks, mainly loose blocks whose shapes were quite irregular and thus did not lend themselves readily to the building of compact resistant walls. The situation of these houses is also against their preservation, as they are mainly in sheltered positions and are thus more subject to the action of moisture.

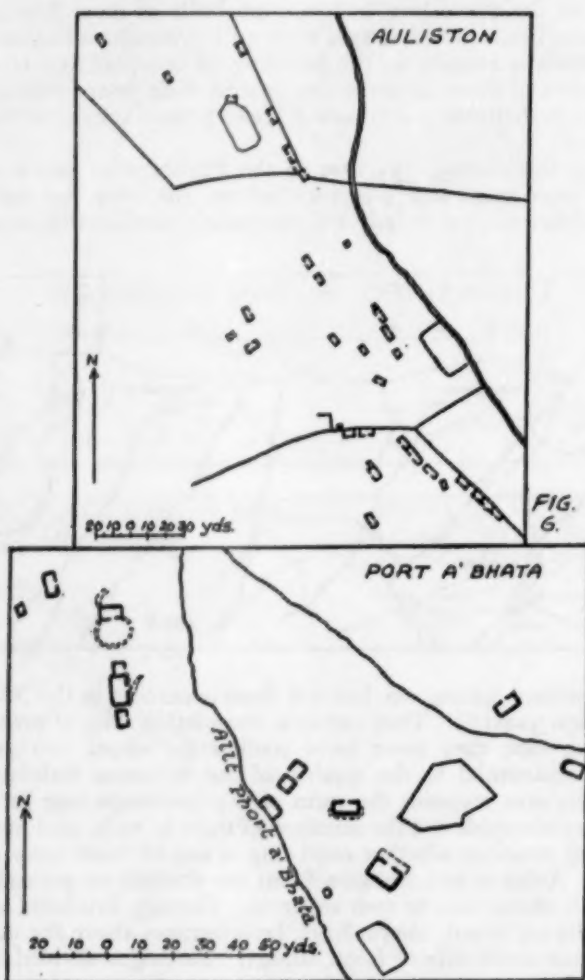
During this survey, 353 sites in the Parish were examined. Of these, 36 were mere traces of foundations, 181 were recognisable as former habitations, but in only 136 cases was it possible to take accurate



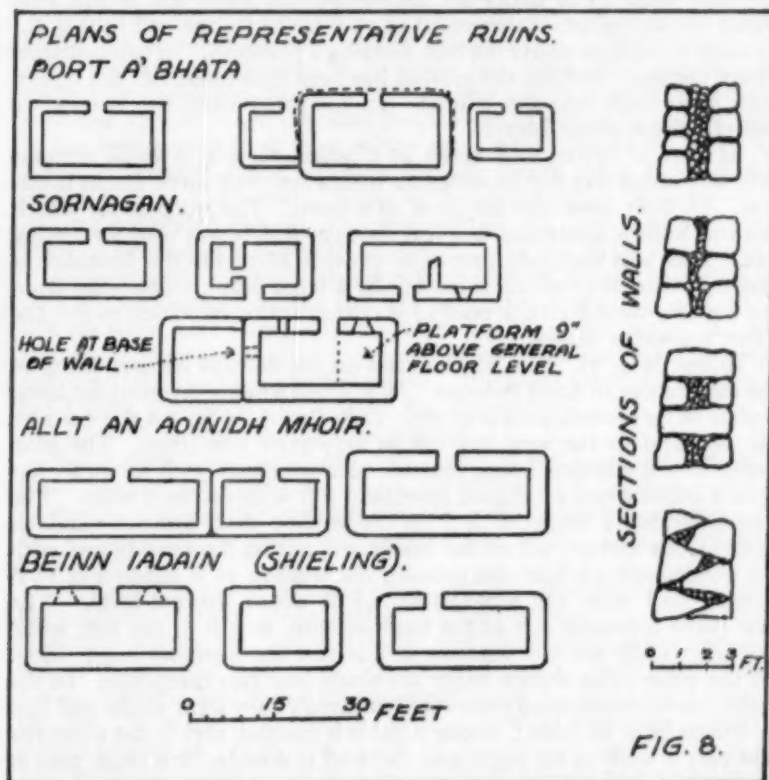
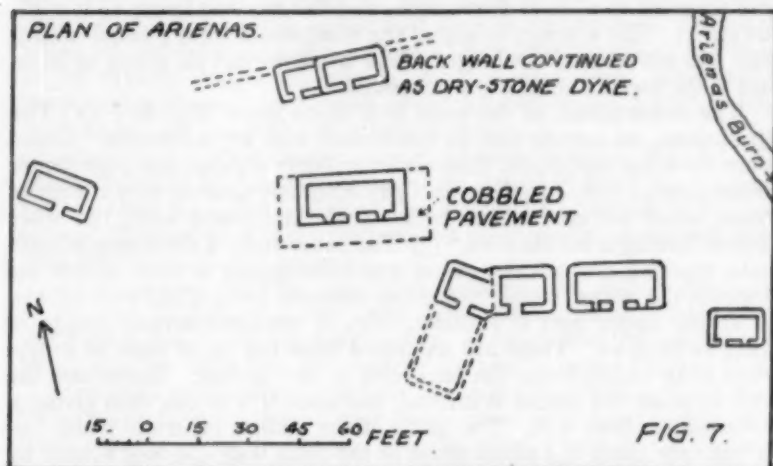
measurements. Among the last are those occurring in the NW of the Parish (Figs. 5 and 6). They are in a remarkable state of preservation considering that they have been roofless for about 120 years, an excellent testimonial to the quality of the dry-stone builders of the time. This area contains the ruins of five townships (see list above). The figures alongside are the numbers of units in each, each unit being a detached structure whether consisting of one or more areas enclosed by walls. Auliston and Auliston Point are situated on ground sloping from 500 ft above O.D. to near sea-level. Carrig, Sruthain, and Port a' bhata lie on broad, almost level, lava terraces above the main lava scarp on the south side of Loch Sunart. Carrig is divided into two sections lying on successive terraces.

Materials and Construction. The material used in the construction of the walls is almost exclusively the local basalt in the form of joint-blocks of varying size, taken from shore exposures of the massive centres of the lava flows. They are often roughly dressed with fairly fresh fracture faces. The larger blocks are used for the bottom courses and for the corners, and in one case the bottom course projects nine inches

forming a ledge round the base. The walls are of the 'dry-stone' type, about 3 ft in thickness at the base and usually tapering to $2\frac{1}{2}$ ft at the top, the inner surface being vertical. The outside corners are generally rounded, especially those facing the prevailing wind which is westerly. The average width of the doorway is 3 ft. In one ruin at



Auliston the lintel is still in position and gives the doorway a height of 5 ft 10 in. from the threshold stones. When the walls are sufficiently preserved to show the number of windows, two are the rule, one on either side of the door, but many have only one. The windows vary in size, the largest in the Auliston area being 3 ft on the inside of the



wall tapering to $2\frac{1}{2}$ ft at the outside, and the smallest being $1\frac{1}{2}$ ft without taper. The average height of the window-sill from ground-level is 3 ft. No estimate of the height of the windows can be given, as in no case is the top of the window preserved.

The construction of the walls is of three types (Fig. 8) : (1) The commonest, an outside and an inside wall with a rubble core. Sometimes the inner surfaces of these walls are fairly regular, but often larger stones project well into the core. (2) Alternate courses may consist of stones which are common to both outside and inside walls, the other courses having a rubble core. (3) The inner ends of the stones of both walls tapering towards the centre and overlapping to some extent the stones of the opposite wall, the spaces between being filled with rubble.

In the upper part of Auliston (Fig. 6) township several groups of ruins lie in rows. These are separated from the lower part by a dry-stone dyke which forms the back wall of two groups. Sometimes the wall between the houses is mutual, but usually it is not, thus giving a thickness of about 6 ft. The inside of the walls is generally plain, but in one case there is a small recess in the back wall one foot square by one foot deep. The floors are usually on one level, but in one ruin which has an inside measurement of 19 ft by $8\frac{1}{2}$ ft, one end (4 ft 9 in.) is raised about 8 in. above the rest, forming a platform. In two instances where the slope is steep, the ground has been excavated and the houses have been built into the hillside. In the other cases the houses are entirely above ground-level.

At Port a' bhata, and again at Uladail, there is a small circular structure about five feet in diameter with a low wall three feet in thickness. In both cases this lies close to a burn. The purpose for which this was built is uncertain, but it is thought that it was used for retting flax. Flax was certainly grown to provide linen for the households, and this structure—which is essentially a large basin, when filled from the stream, would give a pool of stagnant water in which to rot the softer vegetable tissues.

Arienas (Fig. 7). This clachan lies on the delta of Arienas Burn on the north shore of Loch Arienas. As it shows some interesting features, a plan of its central part is given. Other ruins occur on the delta to the east and to the west but are in very poor condition. The plan shows that the largest house (outside measurements 33 ft by 15 ft) has square corners and a cobbled pavement 6 ft wide on three sides. The west gable has a height of $6\frac{1}{2}$ ft on the inside ; there are two windows in front, the eastern 3 ft on the inside and 2 ft on the outside and with the window-sill 3 ft from the ground, the western $2\frac{1}{2}$ ft inside and $1\frac{1}{2}$ ft outside and with the window-sill $4\frac{1}{2}$ ft above ground-level. The east gable measures 4 ft at the base tapering to 3 ft at the top, while the other walls are 3 ft tapering to 2 ft and the doorway is 3 ft wide. Of the other ruins shown, three are single and two composite. In the latter, their construction shows that originally they were single and had additions built on later ; in one a gable is mutual, and in the other the addition is built at an angle and the wall is double for a large part of its depth.

Although the name *Arienas* (shieling of Angus) suggests that the

ruins are those of a shieling, the structures are much too substantial and the ground too fertile to warrant such an assumption. Almost the whole of the delta area shows signs of former cultivation, and it lies at an average height of only 50 ft above sea-level. The ground associated with shielings is generally at a much higher level—in Morvern about 900 ft—and was used for grazing.

Distribution of areas showing signs of former cultivation. (Fig. 3.) The gentle slopes of the Tertiary lavas on the Sound of Mull coast (mainly west of Loch Aline but including the Ardtornish peninsula to the east) formed the chief area of cultivation, and comprised a very much larger area than is worked at present.

Other areas included the flood-plains of the River Aline, the Amhainn a' Ghlinne Ghil, the Trias flats north and south of Larachbeg, the Raised Beaches of the Arienas-Teacuis valley and the Loch Sunart coast, and the delta-fans of tributary streams in upper Gleann Dubh.

The land cultivated at the time of the evictions would yield much better crops than at present, as it would be in good heart owing to the large number of cattle raised. For the same reason the hill-ground would give much richer grazing, as cattle are not such dainty feeders as the sheep which displaced them and their yield of manure is much larger and enriches the soil. In this connection it is interesting to note that the spread of bracken in Morvern has taken place within living memory. Formerly, bracken for bedding milch cows was imported from the area to the north, and this, no doubt, led to its introduction. It has now spread over most of the area, especially on the dried and formerly drained parts. Where the old drains have been choked, rushes form a thick mat. Signs of lazy-beds occur in some of the smaller cultivated patches, but this method does not appear to have been as common in Morvern as elsewhere in the West Highlands.

The ground in the immediate neighbourhood of each township was enclosed by walls. Outside this lay the common grazing, and, as the winters were mild and open, the cattle would remain out all the year round. They were not free to wander at will, but were herded by one appointed for the job—the buachaille. In this manner the grazing on the higher ground was conserved for the summer when the time for the removal to the shieling took place.

Lime must have been used extensively in the local agriculture, as there are two old lime-kilns above the shores of Loch Aline, one on each side, and one on the north side of Loch Teacuis near Rahoy. All are situated on, or near, outcrops of the Lower Lias (Broadford) Limestone.

Shielings. Ruins of shielings occur in Coire Bhorradail⁹ and below the southern scarp of Beinn Iadain. They lie about 900 ft above sea-level, the former on Tertiary lavas, and the latter on Moine gneiss but just below the outcrop of the Mesozoic rocks. Both of these sites are in positions well sheltered, especially from the north, and lying to the sun. The ruins at Beinn Iadain consist of four dwellings, the largest having an inside area of 216 sq. ft, and the smallest 160 sq. ft. The walls are similar to those of the clachans but are in a more ruined condition. A small patch of land was cultivated close-by, and this

might point to more continuous residence than was normal at shielings, but an ample supply of fuel would have been necessary and there is no indication of peats having been cut in the neighbourhood. Such structures formed the summer homes of the women and the young folk whose chief care was the gathering of as much butter and cheese as could be effected without starving calves and lambs.¹⁰ It is to be remembered that the ewes, as well as the milch cows, were milked every day. The numbers of such sheep would thus be much smaller than those of the new sheep (the big sheep) which range hill and strath alike and were objects of detestation even before the coming of the sheep-farmers—"the tooth of the big sheep is the root of all evil."

Spinning filled in the time of the older women. The men during this period would be attending to the crops, the peats, and to making everything snug for the winter at the clachan, but no doubt they found ample time for frequent visits to the shieling. This simple happy life is reflected in the shieling songs which, of all Gaelic songs, are the only truly joyous ones.

The Lurga Mine.^{11, 12} The only mineral of economic importance exploited in the district in the past is galena. This was worked at Lurga in Gleann Dubh about 1737 by the Morvern Company which built an office, store, and pier at Liddesdale on Loch Sunart. The lead ore was carried from underground in creels to the surface and thence to Liddesdale on pack ponies, a distance of almost five miles.

MODERN HUMAN OCCUPATION (Fig. 4)

Apart from the villages of Lochaline and Drimnin, all the houses are in isolated positions and are occupied by proprietors or managers, farmers, farm-workers, gamekeepers, forestry workers, or estate pensioners. There are three schools and school-houses (Lochaline, Claggan, and Drimnin), and pupils from a distance are conveyed by car to and from school. Little change in the type of occupation of these houses has taken place within the past forty years.

The Parish is divided between six estates, only two of which (the smallest) have been in the hands of the present owners for more than thirty years. The largest estate (Ardtornish) occupies the eastern part of the Parish, and belongs to the Smith Real Estate Ltd, which has its registered office in Rutland. At one time this estate included a large area to the west of Loch Aline, but that part—except a strip east of the public road—is now State owned and is administered by the Forestry Commission (Fiunary Forest) and the Board of Agriculture and Fisheries. Cultivated ground on Ardtornish is confined to areas in the Aline valley, Achranich, and SE of the Ferry, Loch Aline, together with domestic gardens. The main crops are hay, corn, potatoes, and turnips. Coniferous wood planted 60-80 years ago has recently been cleared from two areas, one east of the Ferry, and another on the western scarp of the lavas above Loch Aline. The hill ground carries a good stock of Blackface sheep, and the climate is sufficiently mild to out-winter cattle in Gleann Geal. Cows at Achranich furnish the bulk of the milk supplies for the village of Lochaline. Sport does not hold its former important position, though deer (both red and roe) are

numerous, and the River Aline, Loch Arienas, and Loch Tearnait are still famous for their salmon and trout.

It is only in the neighbourhood of Lochaline that a marked change in the economy of the district has occurred within recent times. This has been brought about by the acquisition by the State (Forestry Commission) in 1931 of a large area west of Loch Aline, and by the opening of a 'sand mine' at Lochaline by Messrs. Tennant, Sons, and Co. Ltd in 1940.

Before the war (1939-45), there was sufficient local labour—augmented by St Kildans settled at Larachbeg—for the initial work of the Forestry Commission, but as the area was developed, more was required, and since 1947 a number of European Voluntary Workers have been employed and are housed in huts beside the main road west of Lochaline. The eastern part of Fiunary Forest, stretching from Savary to Lochaline, north to Loch Arienas, and west to the head of Loch Teacuis, has been planted, a nursery has been established at Savary, and development will gradually be extended westwards.

The opening of the 'sand mine' during the second world war made a marked change on the village of Lochaline. The rock mined is the Cretaceous white desert sandstone^{13, 14} with a silica percentage of 99.69, which places it in the same class as the sand of Fontainebleau and Lippe. The workings are entered by a level adit just west of the road beside Loch Aline. The sandstone is blasted and hoppers are filled by mechanical scrapers. The hoppers are drawn out of the mine on a light railway which runs alongside the public road for about half a mile and leads to the crushing and washing plant situated beside Lochaline Pier, where there is also a large concrete storage bin. Ships' holds are filled quickly from this bin by an endless rubber belt. The level adit and the early drives are in Ardtornish Estate ground, but the workings are now under State owned ground. The sandstone is 40 ft thick at the adit, and, though the average thickness is only 20 ft, reserves must be large, as it outcrops below the basalts for at least three miles to the north and occurs on the east side of Loch Aline and under the 'basalt caps', especially Beinn na h'Uamha and Beinn Ghormaig.

The bulk of the labour for the mine work had to be brought into the district, as only a few local men were available. This led to a housing problem which has been partly met by the erection of 25 'pre-fabs' at Tòrr na Fhaire on the hillside north of Lochaline Pier.

Census Returns.^{15, 16} Official population figures show that numbers reached a maximum of 2137 in 1831; that there was a rapid decrease to 828 in 1881, and a slower decrease to 457 in 1951. The writer took a rough census (omitting visitors) in July 1939, and found the figures to be 362. The inclusion of this minimum figure gives a true impression of the population trend, and brings out the increase caused by the new employment afforded by the 'sand-mine' and forestry, an increase which, it is to be hoped, will be continued.

Photographs by courtesy of Mr Robert M. Adam.

¹ SCOTT, J. F. General Geology and Physiography of Morvern. *Transactions of the Geological Society of Glasgow*, 1926-27, 18 (1): 184, 188.

- ³ McLEOD, REV. JOHN. *New Statistical Account of Scotland*, Vol. VII, 1845. Argyll, p. 163.
- ⁴ NECKER-DE-SAUBURE, L. A. *Voyage en Écosse et aux Îles Hébrides*, 1821. Translation from p. 252.
- ⁵ MACCULLOCH, J. *Letters to Sir Walter Scott*, 1824, p. 171 et seq.
- ⁶ McLEOD, REV. JOHN. *Op. cit.*, 1845, p. 183.
- ⁷ CHILDE, V. GORDON. Scotland before the Scots. *Rhynd Lectures* for 1944. (Publ. 1946), pp. 13, 81, 88, 91.
- ⁸ McLEOD, REV. JOHN. *Op. cit.*, 1845, p. 184. ⁹ *Op. cit.*, 1845, p. 182.
- ¹⁰ MACLEOD, REV. DR NORMAN. *Reminiscences of a Highland Parish*. 10th Edition, 1887, pp. 12, 14. ¹¹ *Op. cit.*, 1887, pp. 394-395.
- ¹² McLEOD, REV. JOHN. *Op. cit.*, 1845, p. 170.
- ¹³ WILSON, G. V. The Lead, Zinc, Copper, and Nickel Ores of Scotland. *Memoirs of the Geological Survey. Special Reports on the Mineral Resources of Great Britain*, 17: 90-91. H.M.S.O., 1921.
- ¹⁴ LEE, G. W. et al. The Pre-Tertiary Geology of Mull, Lochaline, and Oban. *Memoirs of the Geological Survey, Great Britain*, 1925, p. 116.
- ¹⁵ MACLENNAN, R. M. A Star-fish from the Glass Sand of Lochaline. *Geological Magazine*, 1949, 86: 94-96.
- ¹⁶ *Census of Scotland*, 1931. Edinburgh: H.M.S.O.
- ¹⁷ *Census of Scotland*, Preliminary Report, 1951. Edinburgh: H.M.S.O.

REVIEWS OF BOOKS

EUROPE

A Geography of Europe. Edited by GEORGE W. HOFFMAN. 9x6. Pp. ix+775. 156 figs. London: Methuen and Co. Ltd., 1953. 52s 6d.

This work contains three general chapters and seven regional descriptions. In the former, Professor East summarises the historical geography of Europe, Professor Bengtson provides an outline of the major features of European climate and orography, and Professor Schloss discusses the contemporary economic problems of the continent. A useful statistical section compares World and European production, and provides details of population, production, diet, and balance of payment accounts in each State.

The regional descriptions, of thirty to forty thousand words each, are contributed by different authors. The features of each region, and of each of the States comprising it, are described in the order followed in the general treatment of the continent. This pattern is most successfully exploited by Professor Hare in his account of the British Isles. In some other parts of Europe, however, where each region contains several States, and many frontiers are of recent date, the method produces somewhat stereotyped discussions.

The book contains much essential information for students of current European affairs, particularly on the post-war economies of Central and Eastern Europe.

B. F.

Die Landschaften der britischen Inseln. By JOHANN SÖLCH. 9½x6½. Erster Band. England und Wales. Pp. xii+1-850. Figs. 1-154. Zweiter Band. Schottland und Irland. Pp. 851-1350. Figs. 155-225. Wien: Springer-Verlag. Vol. I, 1951. Vol. II, 1952. DM 232, or £19, 17s.

Professor Sölch gave ten years to the composition of this work. The troubles of the times delayed its appearance for fifteen, and entailed on him a vast amount of rewriting to repair losses and take account of changes.

The book is not an essay in regional geography. Professor Sölch considered he could best meet the needs of German literature with exhaustive accounts of the various British regions. His aim was not primarily critical or selective. His bibliography, manifestly a real working bibliography, deliberately reflects the aim. It is quite up to his date, and is a valuable gift to British readers. Many of the illustrations are from the author's photographs, and they indicate his endeavour to gain a "tolerable acquaintance" with each of the regions and to escape undue dependence on authorities not always very enlightened. The first volume is given to England and Wales. Scotland occupies three-quarters of the second. A. S.

Scottish Industry: An Account of what Scotland makes and where she makes it. Edited by C. A. OAKLEY. Foreword by The Rt. Hon. Lord Bilsland, M.C., D.L., LL.D. 8½×6. Pp. xvii+332. Plates. Sketch maps. Glasgow: The Scottish Council (Development and Industry). William Collins and Sons Ltd, 1953. 25s.

Apparently conceived as an extension of the Scottish Council's proved policy of co-operation between industries, this handsomely produced volume has been written as a combined effort by one hundred and fifty leading Scottish industrialists. Each has undertaken the chronicling of that particular branch of industry in which his own firm is engaged, and this material has been moulded into book form by Mr Oakley. The success which attends an approach so liberally strewn with pitfalls is a very real tribute to Mr Oakley's direction.

With trifling exceptions, this is a most readable account of Scottish industry which, while fulfilling the purpose of making known the volume, range, and quality of Scottish products, is at the same time a mine of useful information on modern technical advances in the various fields, and on the industrial history of the country. The value and interest of the book are greatly enhanced by fully sixty photographs, chosen to illustrate especially the processes of manufacture, and by nineteen maps which show the location of the various industries. A. A. M. H.

Orkney Miscellany. 8×6½. Pp. 104. 6 illustrations. Kirkwall: Orkney Record and Antiquarian Society Papers, Vol. 1, 1953. 8s 6d.

Orcadians are to be congratulated on being able, with their small population, to publish a volume of papers on historical and archaeological subjects. Geographers will be interested in the account of Orcadian settlement in Canada, by E. W. Marwick, and in the paper, by Dr A. B. Taylor, on the identification of Saga place-names. R. M.

The Glasgow Story. By COLM BROGAN. 7½×5. Pp. 223. Drawings by Keir. London: Frederick Muller Ltd, 1952. 15s.

This 'story' is a series of comments under various heads on Glasgow primarily as a social phenomenon. Most of them are very wise, some are wise-cracks, a few are cheap. The author is very amusing while his tongue is firmly in his cheek: sometimes it escapes. On 'difficult' topics he can be telling without offence. His Glasgow characteristics include a certain obtuseness; King of Surgery Macewen becomes McEwan, he intrudes a *p* into the family name of Lord Kelvin, he drowns J. W. Gregory in the wrong river, and he takes liberties with the movements of the last Prince of Wales. With his data generally he may be more meticulous. For an alumnus of Glasgow his view of the University is curiously extra-mural. To the geographer as such he has little to say, but that little—mostly in Chapter 6—is very valuable. A. S.

Devonshire Studies. By W. G. HOSKINS and H. P. R. FINBERG. 8½×5½. Pp. 470. 8 plates. 11 maps and plans. London: Jonathan Cape Ltd, 1952. 36s.

This book contains seventeen studies in the history of Devon. The subjects range from the making of the agrarian landscape to the fortunes of the Presbyterian churches of Devon. These revealing glimpses into the development of the county provide stimulating reading for any visitor or native with an enquiring mind. B. F.

In Search of Winter Sport. By MONK GIBBON. 8½×5½. Pp. 223. 17 illustrations. End-paper sketch map. London: Evans Brothers Ltd, 1953. 18s.

This book is a pleasant collection of personal reminiscences of holidays spent at various resorts in the Bernese Oberland, Grisons, and Haute Savoie. Being thus largely confined to these areas, it does not meet the need for a comprehensive local guide to winter sports, such as the title might suggest. N. McL.

Three Rivers of France: Dordogne, Lot, Tarn. By FRED A WHITE. 8½×5½. Pp. 232. 49 illustrations. Map. London: Faber and Faber Ltd, 1952. 25s. Reprinted, 1953. 15s.

Miss White gives an account of landscape and life—past and present—in a most lovely region of France. Word-pictures of canyons and caverns, of pastures and farming, of castles and churches, of towns and the people are accompanied by suitable photographs. Countryside and towns reveal the vitality and resilience of French civilisation in this river-country, and this book is fittingly dedicated to the Resistance. Although one chapter is devoted to food and drink, and another to practical advice to travellers, the author has given more than a guide-book. She has managed to 'televisé' verbally scenes in some ten thousand square miles of interesting scenery, and in comedies as well as tragedies enacted there. I. E. C.

ASIA

South China in the Sixteenth Century: Being the Narratives of Galeote Pereira; Fr. Gaspar da Cruz, O.P.; Fr. Martin de Rada, O.E.S.A. (1550-1575). Edited by C. R. BOXER. 8½×5½. Pp. xci+388. 8 figs. 12 plates. [Works issued by the Hakluyt Society, Second Series, No. CVI.] London. 1953. 40s.

In his usual erudite and lucid manner Professor Boxer presents three accounts of Southern China dating to that fascinating period when both Portuguese and Spaniards sought to establish trading relationships with the Ming empire. During the sixteenth century Imperial decrees forbade overseas trade by Chinese merchants, and into the trade vacuum so created came the ships of Portugal and Spain, from bases in Malacca and the East Indies, and in Mexico and the Philippines, respectively. Thus it transpired that Galeote Pereira with other Portuguese found themselves prisoners at Foochow in 1550, the Dominican friar Da Cruz attempted to establish a mission in Canton in 1556, and the Augustinian friar De Rada left the port of Manila in 1575 to contact the Fukien authorities with a view to Spain establishing a port on the Chinese mainland to offset Macao. Each left an interesting account of the countryside they visited and the customs of the people they met. To Da Cruz must be credited the first book devoted exclusively to China to be printed in Europe, to Da Rada the first explicit recognition of China as the Cathay of Marco Polo, and to Pereira an early understanding of the manner in which the urban geography of China can be related to the administrative organisation of the country by the Ming emperors.

An attractive and instructive volume maintaining the high standard of the Hakluyt series. W. K.

AFRICA

The Suez Canal in World Affairs. By HUGH J. SCHONFIELD. 8½×5½. Pp. x+174. 9 illustrations. 2 sketch maps. [Constellation Books.] London: Vallentine, Mitchell and Co. Ltd, 1952. 15s.

Many books have been written on the Suez Canal, including three volumes by Schonfield himself (*Ferdinand de Lesseps, Italy and Suez, The Suez Canal*), so it would be surprising if a slim volume of this nature contained much new information. Indeed, a large part of the work merely reiterates the well-known story of Suez from the time of the canal of the Pharaohs to the realisation of the dream of de Lesseps amidst a hot-bed of political intrigue. Nevertheless, the old story is presented in an interesting way and brought up to date by chapters on the rôle of the canal during the second world war, and the post-war Egyptian demands. The author pays due regard to the geopolitical significance as well as commercial value of the canal, and as a concise introductory study of current problems in Suez this book can be highly recommended.

W. K.

AMERICA

Highland Settler: A Portrait of the Scottish Gael in Nova Scotia. By CHARLES W. DUNN. 9x6. Pp. xii+180. Frontispiece. 2 sketch maps. Toronto: University of Toronto Press, 1953. \$4.00. London: Geoffrey Cumberlege. 32s.

The country south-east of the Gulf of St Lawrence, especially Cape Breton Island, was chosen by West Highland emigrants as one of three principal settling places in North America; in this region their language and culture has been more persistent than in Ontario and Carolina. This Highland community holds great fascination, therefore, not only for Scots generally and for West Highlanders in particular, but also for all interested in the continuance of transplanted cultures in an alien, often antipathetic, environment. Professor Dunn, in this book, is more concerned with the people themselves, than with the place or manner of their settlement. The book is full of interesting information and written in a clear and agreeable style. With its excellent bibliography this comparatively slim volume can be strongly recommended to students of Canada and the Scottish Highlands alike. A. MacP.

POLAR REGIONS

John Rae's Correspondence with the Hudson's Bay Company on Arctic Exploration, 1844-1855.

Edited by E. E. RICH, M.A., assisted by A. M. Johnson. Introduction by J. M. Wordie, C.B.E., and R. J. Cyriax. 9½x6½. Pp. cvi+401+xiv. 2 illustrations. Sketch map and 2 maps. London: The Publications of The Hudson's Bay Record Society, XVI, 1953.

The early part of the nineteenth century saw many Arctic expeditions, most under naval auspices, with heavy wooden ships, large sledging personnel, and vast stocks of provisions and constant dread of scurvy. They aimed at the Pole or the Northwest Passage. About a century ago, the Hudson's Bay Company tackled the Arctic problems by land, using the technique of native trappers. No one man did more on these lines than the redoubtable John Rae. He eclipsed even natives in his endurance and hardihood, covering in a few years several thousand miles by canoe and dog sledge; he even lived in snow and stone huts. Since Rae met with no personal disaster, he never attained popularity; nor had he any partiality for popular travel books. He became known by his finding the first remains of the Franklin expedition and showing the way for future search.

This book contains reprints of his official letters and reports. Most have not previously been made public. They are now ably edited, with a valuable introduction, and reveal one of the greatest Arctic travellers of all time—one who avoided publicity and did first-class work. But Rae's greatest claim to fame was his technique of quick travel, 'living on the land' hunting and fishing as the natives do, bearing in mind that all hunting grounds are not equally bountiful. This work with its scholarly editing will last as a classic of polar travel. R. N. R. B.

EDINBURGH UNIVERSITY EXPEDITION TO ARCTIC NORWAY, 1953

With the recognition of the Edinburgh University Court, a group of students of various disciplines connected with the natural sciences were engaged for eight weeks on glaciological and biological work in the north of Norway in the summer of 1953. Under the leadership of John Heap, second-year geography student, the expedition established a base at Lyngsdal in the southern half of the Lyngen peninsula, where glacial and periglacial phenomena were studied by a party of four. The biological party, of six, was based at Rosta, about forty miles south of Lyngsdal.

The policy of making each man responsible for his separate enquiry was justified by results, though all members of the party co-operated in much of the work. The glaciological programme was probably too wide in its scope, but valuable experience was gained. Relevant to the glaciological studies was the investigation of plant distribution near the ice front. In addition to a general collection of flowering plants and ecological data, the soil fauna in the Lyngsdal area was surveyed and specimens were collected. Small mammals and fruit flies were the concern of members of the Rosta party; a study of breeding birds was made over a wide area. Several other collections and studies were made. A Report of the Expedition has been published in a Supplement (April 1954) to the *University of Edinburgh Gazette*.

CHAIR OF GEOGRAPHY, UNIVERSITY OF EDINBURGH

Professor JAMES WREFFORD WATSON, M.A., PH.D., F.R.S.C., Director of the Geographical Branch, Department of Mines and Technical Surveys, Ottawa, has been appointed to the Chair of Geography in the University of Edinburgh. We welcome back to Edinburgh a former student of his distinguished predecessor, Professor Ogilvie, and a valued member of the R.S.G.S.

LECTURESHIP IN GEOGRAPHY, UNIVERSITY OF GLASGOW

Lt.-Col. J. S. O. JELLY, M.A. (CANTAB.), F.R.I.C.S., formerly Assistant Director, Ordnance Survey, in charge of the Scottish Region, has been appointed Lecturer in the Department of Geography, University of Glasgow, where he will give instruction in Surveying.

ROYAL SCOTTISH GEOGRAPHICAL SOCIETY

PROCEEDINGS

MEETINGS OF COUNCIL were held on 1st June and 29th July 1954.

AWARD : The Mungo Park Medal was awarded to Dr ALAIN BOMBARD.

OBITUARY

By the death of Professor ERIK LJUNGER on 13th March 1954 the Society has been deprived of an esteemed Honorary Corresponding Member. Professor Ljungner was Head of the Department of Geography in the University of Lund, a Vice-President of the South-Swedish Geographical Society, and former President of the Geographical Association of Lund.

ANNUAL GENERAL MEETING

The Annual General Meeting will be held in the Society's Rooms in Edinburgh on Tuesday, 5th October 1954, at 3.30 P.M.

LECTURE SESSION, 1953-1954

The following lectures were delivered :

EDINBURGH. *Usher Hall*.—Dr ALAIN BOMBARD, on "The Bombard Story", April 30th.

GLASGOW. *McLellan Galleries Hall*.—Dr ALAIN BOMBARD, on "The Bombard Story", April 29th.

NOTICE

Copies of the following numbers of *The Scottish Geographical Magazine* are urgently required :

Vol. 13, No. 11; Vol. 20, No. 5; Vol. 22, No. 6; Vol. 26, No. 3; Vol. 34, Nos. 3, 4, 10, 12; Vol. 35, No. 1; Vol. 36, No. 1; Vol. 37, No. 1; Vol. 41, Nos. 2, 6; Vol. 53, No. 1; Vol. 58, Nos. 1, 2, 3; Vol. 59, Nos. 1, 2, 3.

Bound volumes will also be gratefully accepted. It would be much appreciated if such copies of separate numbers and of volumes be handed to the Secretary.

SPLENDOUR OF EARTH

Compiled by MARGARET S. ANDERSON

THIS book, by its arrangement and the nature of its material, will make an immediate appeal, both to serious students of geography and to the wider reading public which the editor also had in mind when compiling it. It is an anthology of descriptive physical geography, containing over two hundred passages of prose and poetry chosen for their qualities of style and realism, and taken mainly from contemporary literature.

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THE EXTRACTS.—The extracts are arranged under headings: Climate; Weather; Winds; Oceans and Seas; Islands; Earthquakes, Volcanoes and Hot Springs; Mountains and Plateaus; Rocks and Soil; Rain and Rivers; Ice, Glaciers and Fiords; and Deserts. Each section comprises accounts of the same phenomena in different regions.

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